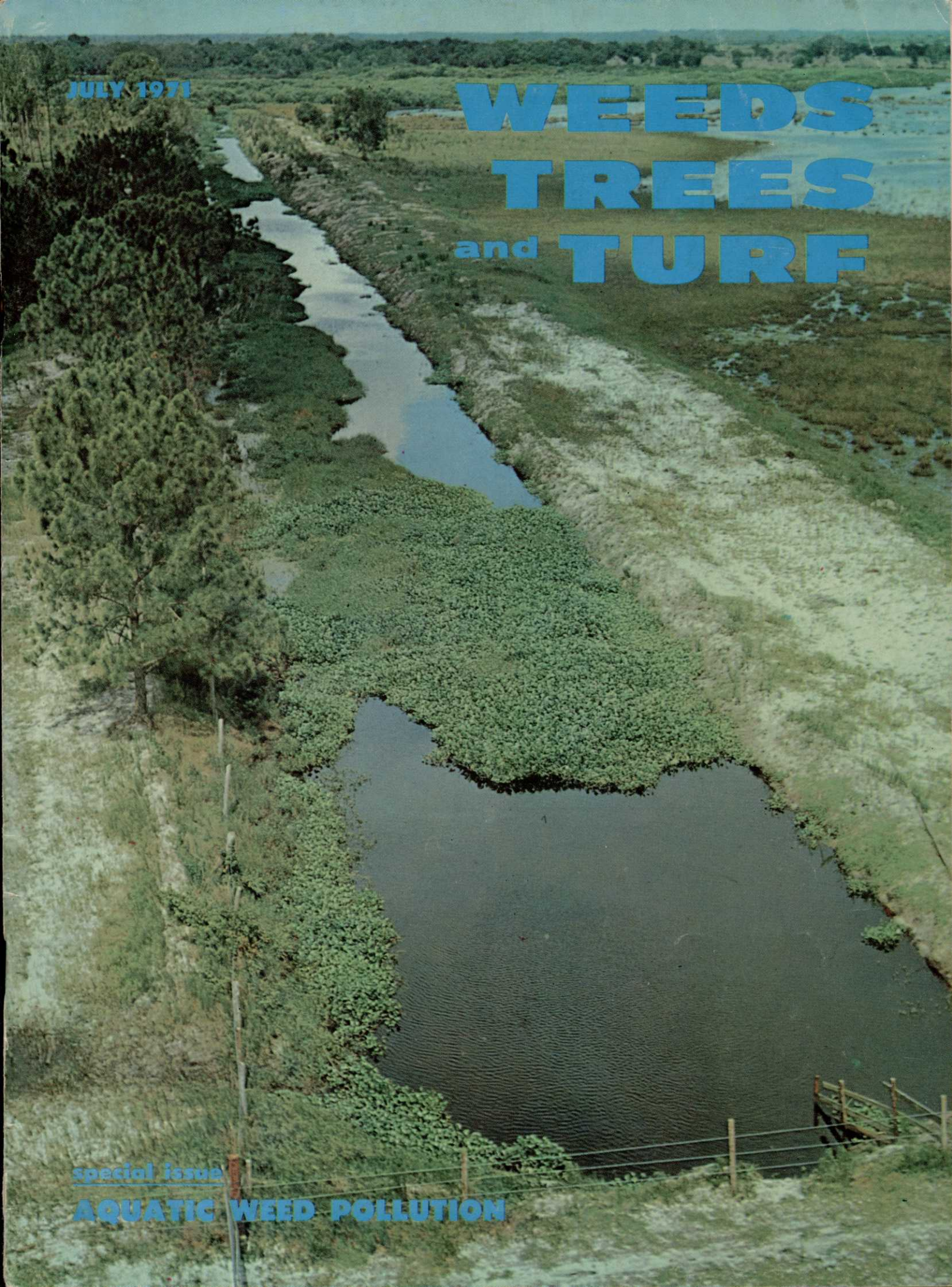
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special issue
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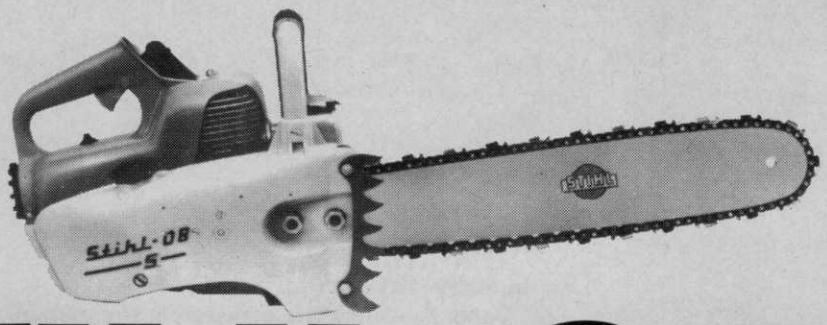

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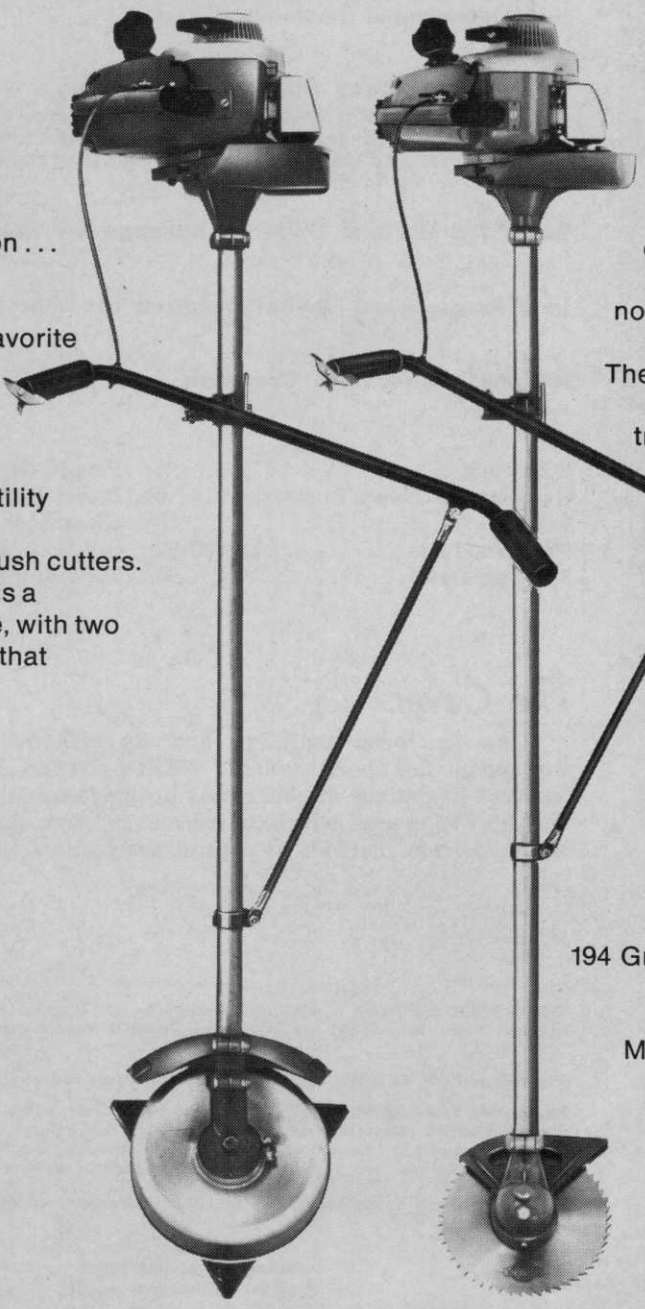

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WEEDS TREES and TURF®

Volume 10, No. 7 July, 1971

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The Cover

Aquatic weed pollution and its subsequent control are featured throughout this special issue of WEEDS TREES AND TURF magazine. The aquatics beginning to choke this drainage canal are water hyacinths, one of a host of species which retard and in some cases eliminate use of water areas. Current methods of control are featured in the ensuing pages.

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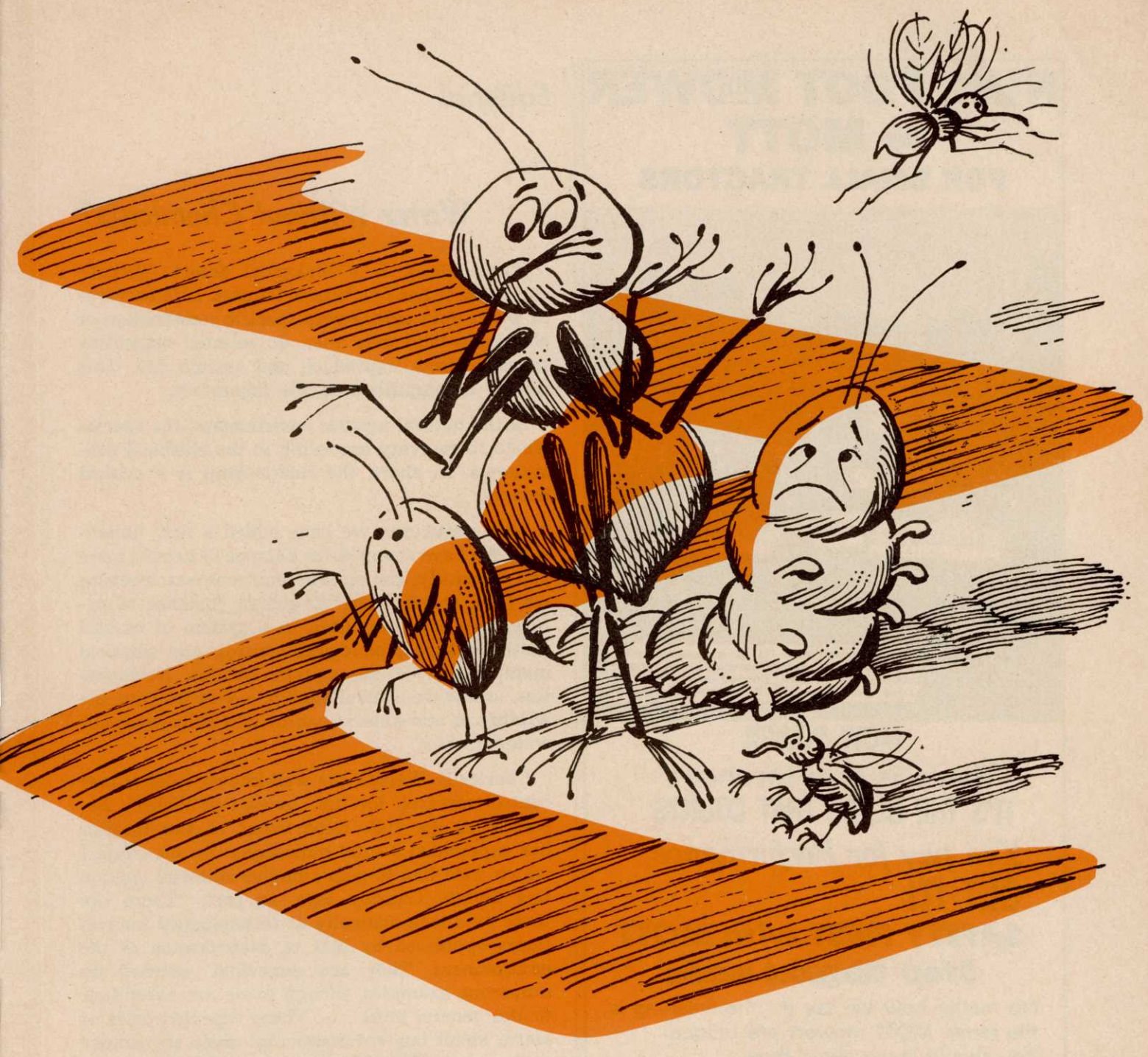

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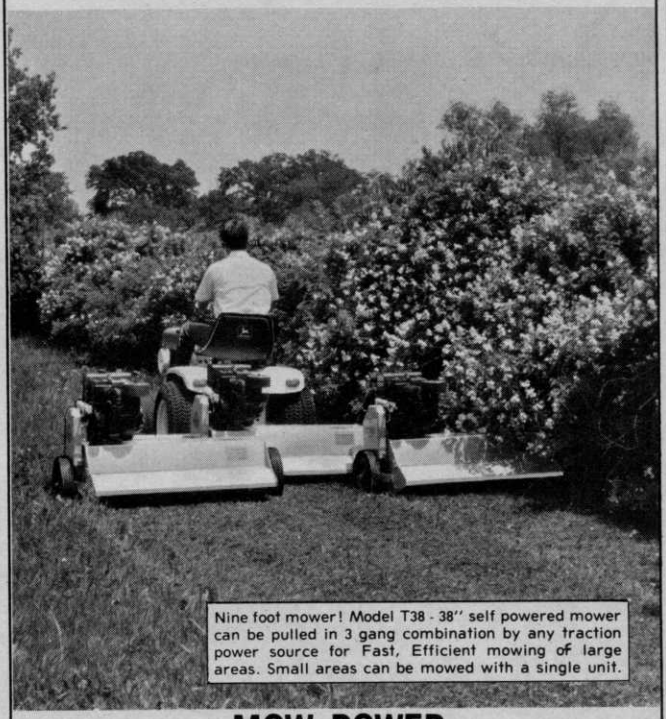

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Editorial

Water Without Chemicals?

Water alone, is a biological desert. Without chemicals it has few beneficial uses. Life survives in water only with a very specific combination of chemicals—and only then do selected organisms tolerate, grow, reproduce and sustain life. This can be accomplished in the laboratory.

In the natural aquatic environment, the species which thrive vary according to the chemical constituents. In short, the relationship is a critical balance.

With pesticides, we have added a new dimension. We have changed the balance to benefit man, and hopefully, the aquatic environment. Because we have changed the oft-quoted "balance of nature," we are committed to a system of careful pesticide usage, biological control, and physical manipulation of the aquatic habitat. Nevertheless, unless we control aquatic weeds we (nor the wildlife of our waters) can benefit fully from our water areas.

Charles R. Walker, the well-known chief of pest control research for the Division of Fishery Research of the U.S. Department of the Interior has expounded a solid philosophy on this subject which we'd like to pass along as editorial opinion this month. Charley says, in part, "There are those who look critically at technological innovations—oppressed by fear of deterioration of the environment. They are somewhat justified by numerous examples, though many are exceptions to the general rule. . . . These repeated cries of alarm about our environmental crisis are similar to the Aesop Fable of the boy who cried wolf—and unfortunately well-meaning scientists also sound alarms, and often about matters far removed from their own special area of competence. Is it any wonder that the public becomes disillusioned with science and scientists—and then suspicious of our technological improvements? . . . Our understanding is based upon respect for different viewpoints but with critical evaluation subjected by the multidisciplinary scientific community. . . . We cannot afford to ignore the special responsibility of the scientific community to both consider the 'good' and the 'adverse' effects of chemicals.

"We can however, maintain the confidence of the public by hearing out opposing viewpoints. . . . I do wish these issues were tried in the scientific arena rather than the public battleground. . . ."

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Government News / Business

From the Congressional Record A keynote statement developed for the Water Resources Congress by Lt. Gov. Tom Adams, long an active champion of conservation programs, has been reprinted in the Congressional Record. Some quotes bear repeating. Stated Adams: "Ecology...environment...pollution...biodegradable...have all become catch phrases in a popular cause--and this is as it should be. But they have also, too often, become scare words...'Wolf' words... used by cynical and selfish people to further their own political or financial gains. One of the goals we must accomplish is to render these polluters of the mind...these distorters of fact...ineffective and impotent so that Americans can be informed properly...can be certain that all of our efforts are toward the same purpose of saving our Nation's natural resources."

And Around the Country From Paris, Tenn., consumer advocate and author James L. Moore announces a statewide consumer protection investigative group, composed primarily of high school and college students. They plan to investigate air and water pollution in the Paris area. Moore, 25, says the group "hopes to collect firsthand evidence of illegal pollution and then seek strict court actions." And in the Bay area of Northern California, the Action for Regional Environmental Agency (AREA) hopes to become the main anti-pollution and conservationist body in nine counties and 91 cities via a coalition of business, civic and environmental leaders. Legislation will be sought to establish it as such.

Tax Relief Bill Sought by NAAA Aerial applicators who are members of the National Agricultural Aviation Association have succeeded in getting a tax relief bill sponsored by Oregon's Al Ullman. The bill (H.R. 8001) seeks to exempt applicators from paying a $25 registration fee (now totalling $150,000 yearly) and other taxes on their spraying operations which apply to other types of aircraft business endeavors.

Indemnity For Bee Losses Beekeepers who lose bees as a result of death by pesticides used near colonies may be paid for losses by the USDA. A program just announced indicates that bee owners may apply through ASCS offices for bee deaths dating back to January of 1967.

Interior Dept. Changes Aid Program Regional offices of the U.S. Department of Interior's Bureau of Outdoor Recreation may now review and approve grant-in-aid projects involving public park, open space, and recreation lands and waters. The original 1964 act setting up funds (Land and Water Conservation Fund Act) has dispensed $503 million through 1971 in 50% matching grants. Decentralization of authority is expected to speed action on many local projects.

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LETTERS TO THE EDITOR

Municipal Program Draws Inquiries

I would like to extend my appreciation as well as that of Mr. Don Smith, the park director, for the fine article of our tree program as published in your WEEDS TREES AND TURF, May, 1971.

The article has brought us numerous inquiries from various administrators associated with city trees. The inquiries have been from Kansas and Nebraska indicating similar problems in this area and the desire for information on how to solve them.

Our department has been a longtime subscriber to your publication, and we have found it very useful in supplying us with background material and new products. I particularly enjoy your "Insect Report" and would like to see it expand to cover more areas of the country. WAYNE WILLMENG, City Forester, Lincoln, Neb.

Sitework Specification Helps

I am a Specifications Writer for The Robinson Green Beretta Corp. I recently saw a copy of your March issue and was very much impressed. This publication appears to have potential value in the writing of sitework specifications. Please advise if the company qualifies for your free mailing list. JOHN BUNCH, Providence, R.I.

Ans. You Qualify.

Permission Granted

Thank you for granting permission to reprint from your magazine. I've added your name to our mailing list and hope you find our Cooperative Extension Service newsletter as useful as we find yours. We heartily endorse all comments and criticism and would enjoy hearing from you from time to time. MAC PERRY, University of Florida, Largo, Fla.

Fine By Us

Needless to say, we were pleased to see the flame weeding article in the April issue of WEEDS TREES AND TURF.

May we, with your permission, reproduce this for distribution as promotional literature? MAE D. AUCELLO, Suburban Propane, Whippany, N.J.

New Equipment Popular

I want to take a moment and thank WEEDS TREES AND TURF for the splendid coverage you gave our foamer known as Wilsco Foam Spray. Our response to this ad was fanastic. HOWARD RAMPY, JR., Mgr. Wilsco, Houston, Tex.

Our Thanks to Fargo Foundry

I was quite shocked by the picture on the front cover of the May, 1971 issue of WEEDS TREES AND TURF in which roadside spraying is depicted, but I do feel I should commend you for cleaning the matter up and showing the proper way to hold a spray gun on page 15. G. L. PIERCE, Horticultural Inspection Supervisor, Ill. State Dept. of Agriculture, Wheaton.

We're Happy to Cooperate

Preparations are underway for publication of our news bulletin, Arbor Action. As discussed in our telephone conversation, we wish to include a reprint of the Bill Johnson article which appeared in the April issue of WEEDS TREES AND TURF. The source will be duly acknowledged. We are grateful for your cooperation. ALAN P. COLFORD, National Arborist Association, Inc.

The Tampa C of C Helped

The Board of Directors of the Hyacinth Control Society would like to take this means of thanking you for the splendid coverage that you gave us in the recent edition of Weeds, Trees & Turf. The pictures were a story in themselves.

With this fine effort the Society can only grow in membership and carry the communications of this membership to all parts of the world—Environmental Management of Mankind, Control of Noxious Aquatics. ROBERT J. GATES, Secretary-Treasurer, The Hyacinth Control Society.

AQUATIC WEED POLLUTION

Industry Problem for the '70s

AQUATIC WEED CONTROL

AN INDUSTRY GROWS

By John E. Gallagher
Amchem Products, Inc., Ambler, Pa.

Gallagher: We now realize the necessity of a total environment concept."

GOING BACK beyond the introduction of 2,4-D to compare the early arsenal of water weed killers with the herbicides available today, it seems a little shocking to see that we still use sodium arsenite, copper sulfate, and aromatic solvents. This is not because they are perfect herbicides and no new ones have come along, but rather an indication of changes in policy to prevent too-rapid introduction of herbicides into our waters. There is a great deal of research under way — work that reflects the cooperative action of many agencies. Federal, state, and industry workers are quite often directly involved in a single project because the multiple-use concept of water utilization requires multiple responsibility for finding answers.

Recent renewal of USDA-ARS activity in aquatic weed control indicates the expanding need for answers beyond those of early work with irrigation and drainage areas of the United States. The amount of work was increased tremendously in 1957 when the Ft. Lauderdale, Florida, facility was established and research personnel were shifted to other weed problem areas. ARS soon found itself deeply involved in all phases of aquatic weed control.

The U. S. Army Corps of Engineers, responsible for keeping navigable waters open, had long been battling water hyacinth. In 1958 a bill authorizing an extensive aquatic plant control program involving eight states released funds for joint research projects and was responsible for the movement of research people into the field of aquatics. Another agency, Tennessee Valley Authority, suddenly has found itself the major experimenter in Eurasian milfoil control, putting increasing manpower and hours into resolving the ever-expanding problem in the chain of TVA lakes.

U. S. public health and water pollution agencies are becoming involved either directly in monitoring programs or indirectly through grant-in-aid programs such as the work being conducted by Dr. John Lawrence at Auburn University in Alabama. This work is concerned with the relationship of weed growth and water pollution. Perhaps the catalyst in the whole resurgence of interest in aquatic weed work is the developing philosophies of the new Environmental Protection Agency. The concern over what is going into our waters is requiring far more complex tests now than ever before. We in industry have to account for residues in waters as well as in fish. We are now concerned with effects on fish production and the total food chain. We are doing research to investigate possible effects on crops irrigated with treated waters and may concern ourselves with stock watering and human consumption.

Submersed Weed Species

Early aquatic weed control work was primarily with pondweed species in western irrigation canals. The species most frequently subject to test was sago pondweed *(Potamogeton pectinatus)*.

Recently (that is, over the past ten years), aquatic weed research has also been oriented toward other submersed species. The rapid spread of Eurasian milfoil *(Myriophyllum spicatum)* throughout the United States, and the more regional problem of Florida elodea *(Hydrilla verticillata)* has caused a marked increase in the number of projects proposed and carried out.

The problem of Eurasian milfoil has been receiving the greatest amount of attention judging by the scale and number of agencies involved. TVA, U. S. Army Corps of Engineers, USDA, the U. S. Department of Interior, the Florida Game and Fish Commission, as well as many individual states, are working to control Eurasian milfoil.

The rapid spread of milfoil following its normal pattern of unobtrusive introduction, a 3- to 4-year period of establishment, and a sudden crisis situation, has been responsible for several crash programs attempting to stem the tide. Perhaps the most fortunate characteristic of milfoil is its susceptibility to 2,4-D, established early in the USDI research program conducted by Steenis in the late 1950's. Recent efforts have been directed toward developing new application methods

(Continued on page 18)

AQUATIC WEED CONTROL

USING AVAILABLE TOOLS

By Andy L. Price
Asgrow Florida Co., subsidiary of Upjohn, Plant City, Fla.

TREATMENT of submersed aquatics is done by one of the following tools: (1) Research—knowledge is a tool provided by research to guide us toward our goal of proper vegetation management; (2) Biological, (3) Chemical, and (4) Equipment.

Research is the prime factor of our survival. The weed problems and areas are known. As we become better informed citizens and learn to restrict our importations of noxious flora and fauna, research will provide us with the necessary tools to survive and master our environment.

Biological tools presently available range from *Marisa* snails to species of the carp family which feed upon submersed aquatics to the *Agasicles*,n.sp. beetles feeding on alligator weed. The use of biological tools is still largely in the hands of Federal and state research agencies seeking more data prior to full scale introduction.

Wholesale importation and use in the United States by well meaning, but perhaps uniformed civic lake and waterway associations of biological organisms could produce disasterous results. It is urged, therefore, that the public obtain council with their state and Federal agencies prior to purchasing any biological control agents.

In the case of herbicides, we need to overcome the image of the skull and cross-bones of past decades and begin to light a candle rather than continue to curse the darkness.

The term herbicide should be stressed to overcome public misinformation of pollution in our environment.

Today, aquatic herbicides are commercially available in either granular or liquid formulations. Thickening agents are rapidly becoming a useful tool for the applicator to work under more adverse conditions with greater safety. Granular formulations are particularly useful on marginal aquatic problems along shorelines. And in specific cases for whole lakes where the granular fromulation control rate is based upon surface acres rather than a depth factor. The weed species being combated and the locale determine the herbicide to choose.

Liquid formulations offer more rapid weed control and in many cases are less expensive to apply. From an applicators view the liquid form's ability to disperse often enables his to achieve control in inaccessable areas.

Equipment—I use the term equipment rather than mechanical control since the control of noxious weeds is attained only when the plants are contacted by a hyacinth bucket, mower blade, or sprayed by a herbicide. Therefore, in essence anything mechanical is merely a carrier to bring about control.

In the aquatic field, application control equipment is unique, in the sense that there are few, if any firms presently producing tools specifically for aquatic use. To qualify this statement, there are known firms producing drag lines and aquatic harvesting mowers, but almost nonexistant are firms which produce a packaged aquatic herbicide application unit.

The aquatic applicator of necessity must research and develop his own equipment to treat specific weeds in specific locales. Many units now in use represent years of trial and error and a great deal of expense.

The candle has been lit and with the cooperation and coordination of all segments of the industry and the public we can regain usage of our lakes and rivers—our 'Wilderness Lost."

Price: "Methods will be forthcoming to regain usage of our lakes and rivers."

AQUATIC WEED CONTROL

THE STRIP METHOD

By L. E. Bitting, Sr.
Old Plantation Water Control Dist., Plantation, Fla.

Bitting: "The strip method can be utilized in many problem situations."

NOXIOUS SUBMERSED WEEDS in the waterways of Old Plantation Water Control District must be controlled or its drainage facilities, developed at great cost for the express purpose of protecting homes and industry from flooding, will be useless.

In past years when Southern Naiad was our number one problem, and before weed control was begun, water stage differentials of three and one-half feet over a reach of one and three quarters miles at times continued for almost two weeks. In such a situation, modern and adequate drainage pumps were idled for lack of water, while nearby lands were flooded.

Now, Hydrilla, a harder to kill plant having phenomenal regenerative capabilities, poses an even greater threat. A typical marginal infestation of Hydrilla, if left unchecked, will cover a canal from bank to bank and from bottom to top. Small canals in remote areas may reasonably be given a full volume herbicide treatment and good control is obtainable with predictable results. However, large volume waterways in urban areas demand completely different management.

STRIP TREATMENT

Although marginal strip treatment is not a new concept in aquatic weed control, it may be helpful to note some of its advantages and disadvantages for those who contemplate its use for the first time.

This method is economical because only a portion of a given waterway is treated to control concentration, and if treatment is begun before weeds cover the entire submerged area, this may be enough to halt their spread. Damage to aquatic organisms is vastly reduced as compared with full volume treatment, and the normal ecological balance is soon restored.

Some faults of the strip method are: There is occasionally poor or no control due to dilution; adverse effects of the variables in weed control tend to be magnified, thus loss of time and material is more frequent; unharmed plant segments provide material for reinfestation; it is more difficult to plan efficient rates and application procedures because of irregularities in weed stand, depths, flows, cross-sections, etc.

APPLICATION

As an example, the infested margin of a canal was measured and found to average 20 feet in width and 8 feet in depth, thus an imaginary triangle with a cross-section of 80 square feet. Our aim was to treat this section with Acrolein at the rate of 7 p.p.m./v. Treatment was begun on June 25, 1968, with others following periodically and with rates running from 7 to 9 parts per million.

RESULTS

In seven days, plants were defoliated and limp. Twelve days after treatment, algae was gone and the surface clear of Hydrilla. Acceptable control continued for about six months in nearly all treated margins.

FISH KILL

Fish kill was far lighter than expected. An initial pick-up was made the day after treatment with follow-up as needed.

TECHNIQUE

Since Acrolein is very toxic to fish and this canal had a high fish population, a high fish loss was possible. However, as stated previously, loss was low and the method of application was believed to be an important factor. As the sprayboat advanced in shallow, edge waters, fish were constantly observed darting into deep center waters. Acrolein was injected 2-4 feet from the water's edge and allowed to spread through the Hydrilla stand. Evidently, very few fish returned to this chemical cloud, but rather stayed in fresh center waters thus escaping lethal contact.

A relatively long treatment section does not seem to be detrimental as long as only one margin is treated

(Continued on page 18)

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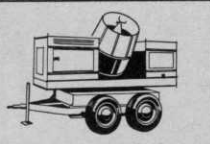
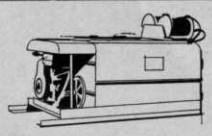
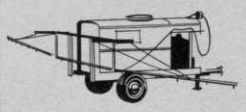


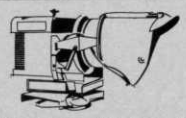
ROTOMIST available in a wide range of capacities.



ROYALIER SKIDMOUNTED delivers 20 gpm at 400 psi

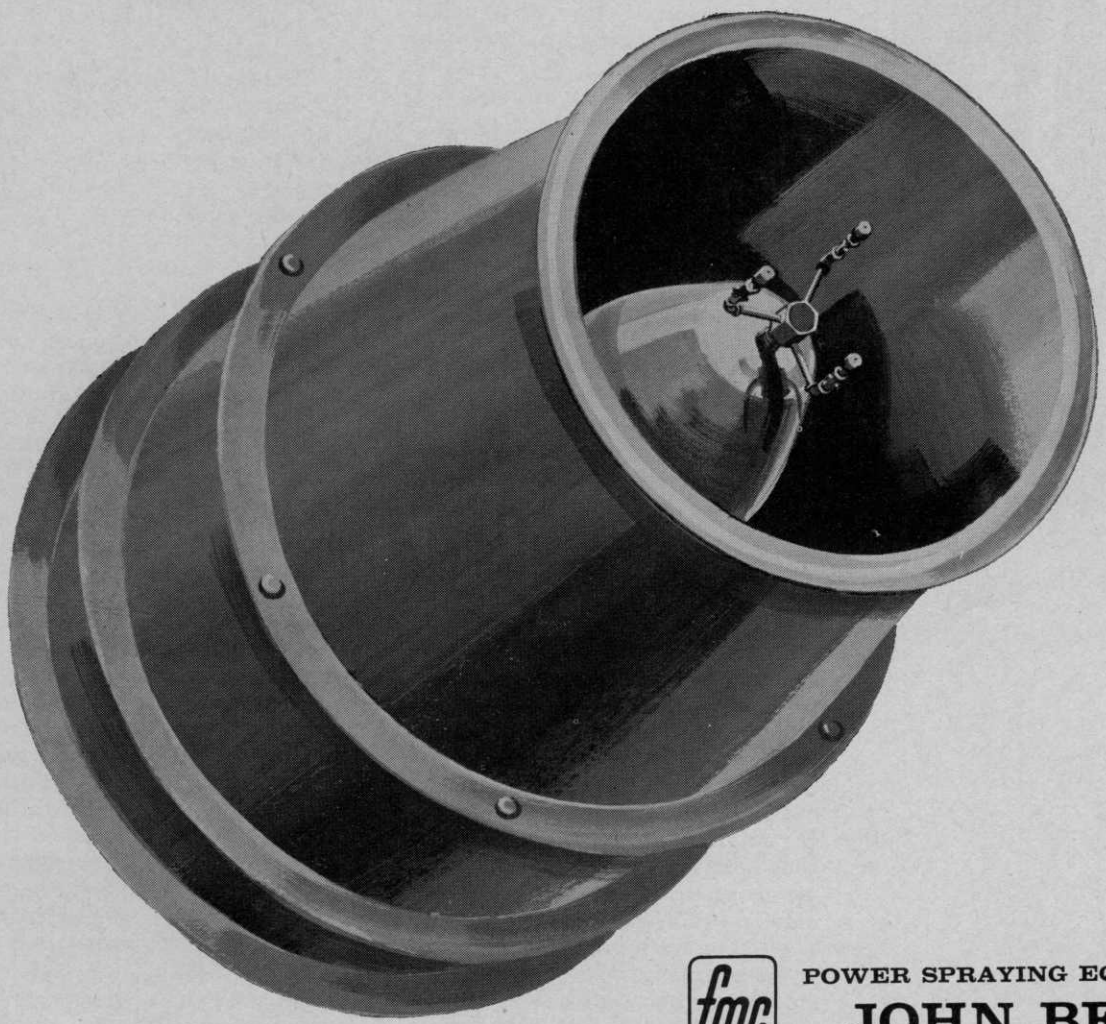


MODEL 1010 TURFKEEPER has flotation tires for golf course use.



ROTOCAST broadcast air sprayer effectively handles all weed-killing programs.

Spray control is straight-through air



fmc CORPORATION®

POWER SPRAYING EQUIPMENT

JOHN BEAN

DIVISION

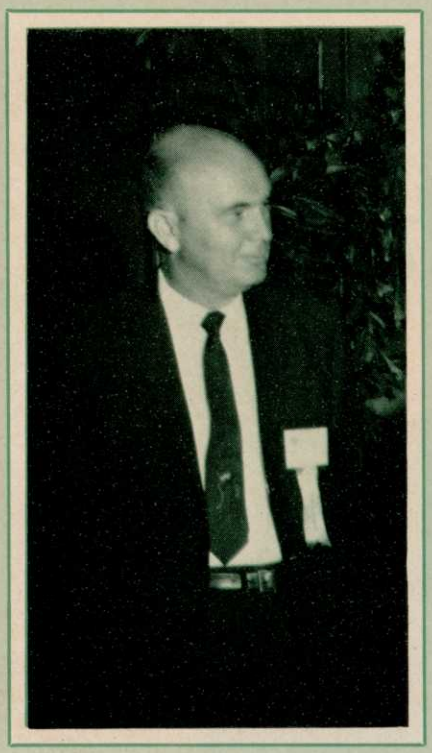
Lansing, Mich. – Orlando, Fla. – San Jose, Calif.

For More Details Circle (109) on Reply Card

AQUATIC WEED CONTROL

MECHANICS OF SPRAYING

By Frank L. Wilson
Polk County Mosquito Control, Eaton Park, Fla.



Wilson: "Understanding of the major principles increase your percentage of success."

WE APPLY HERBICIDES as a spray because:

—Water is a cheap readily available herbicide carrier.

—Small amounts of herbicide can be diluted in water and spread evenly over the entire area being treated.

—Large areas can be treated rapidly.

It sounds simple, yet many different factors from chemistry and physics are involved in spray application. Each of these factors can be compared to a brick in a wall, it plays a part but it is not the entire wall. Because of this, the following factors have been listed individually.

Spray Formulations

Most chemicals have to be modified in some manner so that they will mix with water. We call these different types of formulation. There are three major ones.

1. Solution—In this category the chemical can be dissolved by or mixed with water. The resulting solution does not separate into water and chemical if allowed to stand. Alter initial mixing agitation is not required. Most herbicides fall in this category.

2. Emulsions — This category of formulation is used to mix oil or oil-like chemicals with water. The better the grade of emulsion, the less agitation it requires to keep it mixed with water. A good emulsion looks like milk.

3. Wettable powders — Formulation of this type contain a pesticide that has been mixed with or sprayed on a "carrier" powder. The entire mixture has been treated with a wetting agent so that it will mix with water. Formulation of this type requires constant agitation.

The purpose of each of these types of formulation is to allow the use of water as a physical carrier so that small amounts of a pesticide can be spread uniformly over a large area. As soon as the spray hits the plant, the water part of the spray starts to evaporate or dry. As this occurs the herbicide comes in contact with the leaf and is deposited. As soon as the chemical is deposited it can begin to act.

Morphological Characteristics

The physical characteristics of a plant influence retention and uptake of an herbicide. Leaf shape, leaf position, type of leaf surface and the density of leaves all play major roles in the problem of getting enough herbicide into a plant to kill it. Collectively, the physical characteristics of a plant act as a group of "obstacles" to successful herbicide application. We must apply our herbicide in a manner to bypass or circumvent these obstacles in order to achieve weed control.

Plant characteristics that influence retention and uptake of herbicides.

- Leaf Shape
  - Broad—generally easier to kill
  - Narrow—generally harder to kill
- Leaf Position
  - Horizontal—holds spray well
  - Upright—spray tends to run off
- Leaf Surface
  - Waxy—spray beads, runs off
  - Hairy—spray held out away from leaf surface
  - Sculptured—sculpturing may channel spray—increases run off
- Leaf Density
  - Heavy—many leaves
  - Light—few leaves

Nozzles

There many techniques and devices that have been developed for shattering a liquid into the small droplets that we call spray. All these devices use some form of energy to break up the liquid and create the tremendously expanded surface of many droplets. The most frequently used type of nozzle in weed control operation is the hydraulic pressure nozzle. For our purposes there are three main types of this nozzle which are identified by the spray patterns they create.

1. Straight stream jet—the spray emerges from a central orifice as a solid stream and breaks up into spray several feet from the nozzle.

2. Hollow Cone—the spray passes through a whirl plate and acquire a high revolution per minute before it passes through the spray disc orifice. Centrifugal force makes the stream form a hollow cone pattern.

Most of our adjustable spray guns such as the spray master, spraymeiser or "orchard" guns can be adjusted to produce either 1 or 2.

3. Flat fan patterns—these are nozzles in which the orifice is milled oblong so that the spray pattern is long and narrow.

a. Tee jet and Vee jet nozzles —these flat fan nozzles are most commonly used on spray booms. They provide very even coverage of a swath. Tee jets are low volume nozzles, Vee jets are high volume nozzles.

b. Off center nozzles (O. C. type) these nozzles provide a wide off-set flat fan spray, under proper conditions they can be used to cover as much as a 30-foot swath.

Surface Tension

Molecules are the sub-microscopic "bricks" of which all things are made. Each molecule exhibits "forces" or "pull" similar to a magnet. Water has surface tension because of its molecular structure which causes each water molecule to have a strong attraction for other water molecules. Molecules on the surface are pulled inward because there are no water molecules on the other side to exert force to pull. This inward force causes water to stay in the smallest possible area, which is a sphere or drop; in other words, surface tension causes water to form a "skin" and makes it form drops.

Spray Droplet Formation

The physicist recognizes several modes of droplet formation, however for our purposes weed control spray droplets are formed by two methods, aerodynamic breakup and instant atomization.

In aerodynamic breakup, the spray issues from the nozzle in a solid jet at high speed. At these high velocities the liquid jet travels straight initially, then due to aerodynamic forces, tends to be stripped apart into "primary" droplets. These droplets are tear shaped. The length of the tail on the primary droplet is proportional to the speed of the droplet at the time of break up. The higher the velocity of the drop the more the tail is elongated. Surface tension acts on this elongated tail causing it to break up into many secondary droplets.

Instant atomization is characterized by the spray issuing from the nozzle in a thin sheet. Due to the resistance format this sheet first develops "ridges" that separate from the sheet as filaments or threads of spray. Surface tension then reduces the threads into droplets.

The lower the spraying pressures, the lower the velocity of the spray. The lower the velocity, the less aerodynamic force present to shatter the spray into droplets. In other words, low pressure results in larger spray droplets.

Viscosity

Viscosity is the resistance a liquid has to flowing. We add thickeners, such as Vistik, to form a spray with syrup-like consistency.

Spray Droplet Size

Spray droplet size is governed by surface tension, viscosity and spray velocity.

Surfactants

Each of us has seen droplets of water on a newly-waxed car. We know that these droplets "stand up" and do not spread over or wet the waxed surface. This phenomena is caused by surface tension. Water can "wet" a substance if its molecules are attracted to the molecules of the substance being sprayed. If these two groups of molecules tend to repel each other then the water forms "beads" such as we see on a waxed car.

In most plants the outer layer of each leaf is made up of wax-like components. Herbicides that are applied as sprays to such plants tend to "bead" or even run off the leaves. In order to overcome this problem we add surfactants to our sprays.

"Surfactant" is a coined word which combines the words "Surface active agent." It is probably easiest to visualize the action of a surfactant as a chemical "public relations" compound. A good surfactant has two positions on its molecule. One of these poles is attractive to wax, the other pole is attractive to water.

When a spreader-sticker type surfactant is added to a spray it remains relatively inactive until the mixed spray is forced from the nozzle and spray droplets are formed. At this point the water-loving end of the surfactant molecules turns inward and the oil or wax-loving end of the molecule orients to the outside of the droplet. Upon impact with the leaf the surfactant forms a "go between" layer linking water to wax.

With surface tension reduced or eliminated the spray spreads on the leaf surface rather than forming a drop. Due to this spreading, greater efficiency is achieved through better coverage. In some cases it is even possible to reduce the amount of herbicide required by the addition of a surfactant.

Coverage

In order to obtain consistent herbicide kills it is necessary to apply sprays so that even coverage is achieved over the entire area. If we can use a boom-type sprayer that can be driven at a known speed while applying a known amount of spray per minute we can apply a very precise amount of herbicide

(Continued on page 49)

NEW AQUATIC PRE-EMERGENT GRANULAR WEED KILLER

CASORON® AQ

DICHLOBENIL AQUATIC WEED KILLER

CASORON AQ is the most effective known means for controlling hard-to-kill STONEWORT or CHARA. When left uncontrolled, this attached algae will spread and infest entire water area. In addition, CASORON AQ eliminates many rooted-submersed weeds.

CASORON AQ must be applied early in the season before weed growth begins. CASORON AQ's granules have excellent sinking qualities and kill weeds before they have a chance. CASORON AQ can be used as a total pond treatment, or as a partial spot treatment around boat docks, swimming areas, and other recreational water areas. When used properly CASORON AQ permits adequate safety to fish and marine organisms.

For full details and an illustrated list of the hard-to-identify weeds CASORON AQ controls write: 05125

CASORON T-H®

THOMPSON-HAYWARD CHEMICAL CO.

P. O. Box 2383 Kansas City, Kansas 66110

For More Details Circle (131) on Reply Card

You, too, should be curious about this magnificent young beauty among lawn grasses. 0217® Brand Fylking Kentucky bluegrass is a great green because it greens up earlier in spring, stays green longer in fall. Curiously, Fylking thrives when cut at ¾ inch (even as low as ½ inch) making possible backyard putting greens with no special care required. Its curious name, Fylking, refers to its quality of dense root growth that crowds out weeds. It's a Swedish word because Fylking was discovered in Svalof, Sweden, and developed in America. Internationally tested, Fylking has proven superior over a 12-year period. Fylking is more disease-resistant, produces no seedheads, takes heavy traffic and resists drought. Get curious about this wonderful lawn. Available now at local wholesale seed or sod distributors.

0217 BRAND

FYLKING
KENTUCKY
BLUEGRASS

U.S. Plant Patent 2887

Another fine product of Jacklin Seed Co., Inc.

Bitting *(from page 14)*
at a time. An interval of at least a week should be allowed between treatments.

EQUIPMENT

The application pipe was a ten foot length of ½ inch thin wall electrical conduit with three inches of the outer end curved down to aid injection and shed trash.

Chemical was educted into the spray system as opposed to a pressure activated system; metering was accomplished by an orifice plate in the eductor line. Various apertures may be used to accommodate the desired output and boat speed. Gasoline may be used to calibrate the equipment.

MISCELLANEOUS OBSERVATIONS

Herbicidal activity of Acrolein was much slower than was normally observed in full volume treatment even though summer temperatures prevailed.

In several instances, small feeder canals were treated on one margin only. Filamentous algae were removed and the margin remained clear for two to three months while the opposite edge supported the usual heavy growth.

The fact that Acrolein requires a relatively short contact time, and degrades rapidly, makes it useful for marginal strip use.

We hope that research will soon bring a compound into practical use that will be non-toxic to fish as well as an effective control agent, but until then, Acrolein and the strip method can be utilized in many problem situations.

Gallagher *(from page 12)*
and formulations. Ease of applying 2,4-D granules was improved by Amchem's Spreader Disc for helicopters and the West Point Products Aeriblower for shoreline boat application. Last year, based on previous test plot work, the dimethyl amine form of 2,4-D was applied large scale during the month of May with considerable success. Steenis (1) has been utilizing fluctuating tidal movement to minimize operational difficulties. In its efforts to control milfoil in 1969 the Engineers utilized both helicopter and boat blower systems for applying granular 2,4-D. In Florida a multiple-agency operation organized a large-scale test program and used everything from an airboat to a helicopter to apply a wide range of herbicides and formulations to control Eurasian milfoil which had become a potential hazard to its resort spring attractions. A number of materials were effective, but all are more expensive than 2,4-D. Although 2,4-D is a partial chemical answer to this particular species, milfoil spreads so fast that no single approach is adequate. The 15 papers presented at a one-day TVA conference on water-milfoil research and control gives an idea of the scope of research activity by personnel involved with the species.

Elser (2), responsible for directing the operational weed control work in Maryland, reports that the decline of tremendous acres of Eurasian watermilfoil in the Chesapeake Bay could be pathological. Two diseases, Lake Venice and Northeast (names for convenience as they have not yet been positively identified and classified) were generally found in the regions of large-scale milfoil decline. Elser reports that Suzanne Bayley of Johns Hopkins University determined that the Northeast disease organism is a filterable agent, possibly a virus. A small controversy exists in the minds of several researchers as to whether the "disease" is in reality a response to high salinity associated with salt water intrusion which occurred over a period of drought years.

The amount of work on other submersed species is generally related to problem size and rate of increase. Florida elodea is rapidly becoming a major weed problem in Florida waters. Blackburn (3) found that acrolein, aromatic solvents, copper sulfate and a diquat-copper sulfate mixture provided temporary control, but the diquat-copper sulfate is the only treatment not highly toxic to fish. Other work on elodea reported over the past few years shows copper sulfate mixtures of copper sulfate and diquat, diquat plus endothall, and blackstrap molasses added to phenoxy compounds controlled this species. Ware (4) reported that 100 lb. of copper sulfate per surface acre provided economical control of elodea. Larger crystals produced better control. Foret (5) used blackstrap molasses as a source of aconitic and itaconic acid and glucose. These materials added to phenoxy compounds increased control of elodea and other submersed species. In the laboratory at Ft. Lauderdale where the nutritional and reproductive studies of Florida elodea simulate field conditions, Weldon (6) found that the WASM formulation of endothall doubled or quadrupled effectiveness in field trials.

(Continued on page 34)

Report From Aquamarine Corporation

THE AQUATIC WEED HARVESTER IN THE PARK SYSTEM

PARK AND RECREATIONAL waters are being endangered by extra nutrients and resulting aquatic weeds. Thus, many over the U.S. have converted to mechanical harvesting. Aquamarine Corporation supplies equipment to fit specific needs of such water areas.

Company records include the New Braunfels, Tex. Municipal Park District. Here flows what Ripley called the shortest river in the world, the Grand Blanco. It runs only 2½ miles.

The Grand Blanco flows out of a fault line escarpment in Landa Park at the rate of 338 cu. ft. per second. The nutrient level has been rising steadily in these waters and, along with it, aquatic vegetation. First, a mechanical cutter was used and the cut weeds left to float. However, a hydro electric plant downstream failed to function with these conditions.

The Park District then purchased an Aquamarine H-650 Harvester, along with a shore conveyor. The harvester works well in the one-foot shallows as well as the five- to six-foot depths. Both river and lake have been cleared.

At the Berkeley (Calif.) Park and Recreation Department, a 68-acre lake, Aquatic Park, has become nationally known for the national water ski competitions. Park use was threatened by heavy encroachments of a weed locally called "duck weed" (Ruppia Maritime). Fresh water input contained excessive nutrients and tidal salt made the water brackish. With no natural enemies, the weed thrived. In August, the weed regularly died off and massive biological oxygen demand increases resulted. Most fish then died, the lake becoming a stinking quagmire. This negated its use until the organic material returned to the bottom or into solution. An Aquamarine H-650 Harvester was purchased along with shore conveyor and mobilizing attachments to haul the equipment back to storage after use. The operation has been highly successful.

In the Los Angeles area, the Big Bear Lake Pest Abatement District found their prime recreational area being completely ravaged by the encroachments of elodea and milfoil. Big Bear Lake is east of Los Angeles at an elevation of 6,500 ft. above the Mojave Desert. It is controlled by an authority that sells water to irrigation users in the valley.

In August, 1970, an Aquamarine Harvester was purchased. It is being used to cut in selected areas of this 2,000-acre lake, at a rate of four tons of weeds every ten minutes. The lake is now open and clear again for a wide range of recreational activities.

Farther south, Lake Cuyamaca, a fifty-acre man-made body of water in the mountains, east of San Diego, was being choked with a strange woody weed that grew in twenty feet of water and extended as much as eighteen inches above the water surface. Twenty-five percent of the lake had already been covered when the Lake Cuyamaca Recreation and Park District took delivery on a new Aquamarine SAWFISH, a cutter that cuts an eight-foot swath at a five-foot depth and pushes the cuttings to shore for recovery. The application has returned the lake to full usefulness.

Eleven hundred-acre Lake Beulah in eastern Wisconsin is another example of the effectiveness of a methodical approach to mechanical harvesting over a longer period. It is also an example of the successful protection of a lake from accelerated eutrophication.

In Wisconsin, certain areas may legally set up their own sanitary districts with some tax levying powers. These districts are self-governing and control their own budgets within certain limits. The tax money accrued can be used for lake improvement and maintenance purposes.

Lake Beulah had 110 acres badly infested and approaching the point where dredging or abandonment was inevitable.

On a contract basis in 1969, Aquamarine equipment — a complete AQUA-TRIO with Harvester, Transport and Shore Conveyor — was hired to harvest the infested area. There were two cuttings in 1969 and one in 1970. The Sanitary District and riparian owners in 1970 then purchased their own AQUA-TRIO.

Because the Aqua-Trio is simple to operate all Beulah harvesting has been done by inexperienced summer employees and proved highly satisfactory.

The growths of lily pads, coontail and pond weeds have been selectively harvested with fish spawning beds preserved and the recreational areas opened. Accelerated eutrophication of the lake has been stopped.

Left to right, Aquamarine' Sawfish which cuts swath 8' wide, 5' deep, H650 Harvester unloading, and harvesting.

Coarse grasses like this barnyard grass defy mowing, says Norm Robie, right, in session with Steve Derrick, Diamond Shamrock.

Challenge for Golf Supe

BATON TWIRLERS AND GOLFERS

By DONALD McGUINESS

IT ISN'T every grounds superintendent who goes about his work surrounded by as many as 300 beautiful girls. But that's the burden which Norm Robie carries at the Smith-Walbridge Camp near Syracuse, Indiana. He is maintenance director and grounds superintendent for the camp. It includes a school for baton twirlers as well as a golf course.

All summer, groups of 300 or so girls arrive at Smith-Walbridge for a week of concentrated instruction and practice in the camp's specialties of baton twirling, "drum majoring" and related activities. During the last three weeks in August, school band marching participants come to the camp for music instruction and marching practice.

Keeping the turf in shape on the practice drill fields at the camp is a tough job in anyone's book, and Robie is constantly striving to keep it looking good and easy to march on. "Those girls will wear this grass down to the bare dirt at the turn points." Robie exclaims. "And we've been eaten up with crabgrass that won't cut neatly. Right after we've mowed it simply pops up, looks unsightly and is difficult to march on."

In 1969, the turf at Smith-Walbridge Camp had become about 60% crabgrass and other annual grasses, and these unsightly pests were rapidly crowding out the bluegrass and fescue which Robie was reseeding regularly. Something more drastic had to be done.

Robie had heard about a pre-emergence herbicide, Dacthal, that really controls crabgrass while being extremely gentle on desirable perennial grasses. In the spring of 1970 he applied Dacthal W-75 wettable powder at 12 lbs. per acre. "We used our new sprayer setup," he says, "and it worked like a charm." The "setup" is a Broyhill sprayer with a 100-gallon tank, fitted onto a Cushman cart, with an 18-foot boom. "With this rig, we can cover an acre before we have to refill," he says.

Robie is "plenty satisfied" with the results he saw as early as June, 1970. "I'd say we got 95% to 98% control of the crabgrass," he exclaims. "What's left looks more like a perennial rye grass or rough fescue." The Dacthal, because it affects the seedling sprout only, hasn't bothered the desirable perennial bluegrass and fescue at all.

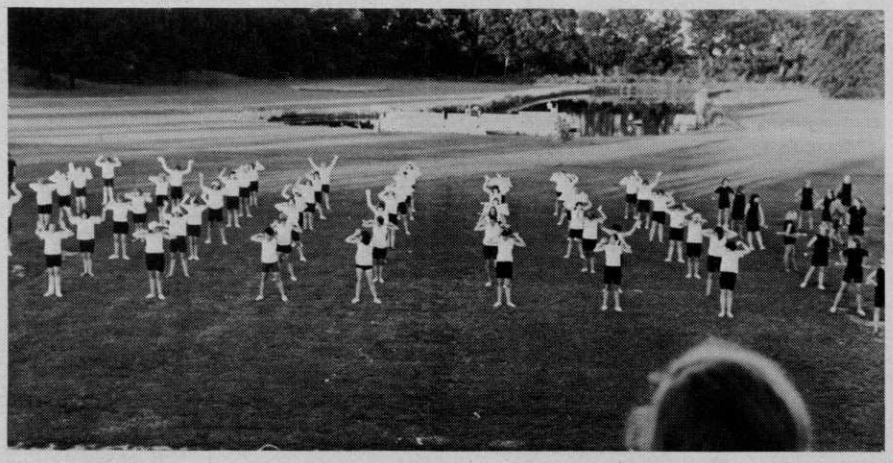
The golf course is another part of Robie's job. He is superintendent of the 18-hole Maxwellton Golf Course, which lies just across the road from the camp. Smith-Walbridge recently bought the golf course, and as a result have incorporated a golf instruction program into the camping activities.

"When I took over nine years ago, that golf course was nothing more than a cow pasture," Robie says. "I put it in shape, and we're planning on installing sprinkler irrigation soon." As a result, he wants to start eliminating *Poa annua* and allow perennial bluegrass to cover the course.

Diamond representative Steve Derrick has worked out a plan with Robie that will allow the *Poa* to brown out, and Dacthal to stop the new seedlings from growing and replacing the burnt-out grass. "We should apply 18 to 20 pounds of Dacthal before the middle of August," Derrick says, "and then follow up with 14 lbs. per acre in the spring."

"It might be a brown course in many places this fall," Robie admits, "but if it will mean eliminating the *Poa* without hurting the bluegrass, it might be just what I'm looking for."

Baton twirlers are tough on drill field turf. Challenge is to maintain quality.



PRECISION
TREE DESTROYER

PRECISION MODEL 75 TREE DESTROYER

A completely self-supporting system for converting entire trees, trunks, limbs, leaves and all into small chips in a few seconds. Feed through rate is approximately 125 feet per minute. Maximum opening in spout is 22" diameter. No outside power source is required.

FEATURES:

1. 75" — 3 knife Precision Chipper powered by Cummins 310 HP diesel engine.
2. Hydraulically powered crushing rolls.
3. Heavy duty articulated knuckle boom loader with 20' reach and 400 degree swing, capacity at 15' is 7504 pounds.
4. Hydraulically powered chip discharge spout for spreading or loading chips.
5. Chipper hood opens easily with one man by hydraulic hand pump.
6. Air system built in for air wrench to change knives.
7. Heavy duty stabilizers powered hydraulically on all four corners. Set up for operation in a matter of minutes.
8. Air brakes and lights to ICC regulation.
9. Hydraulically powered reversing conveyor 25' long with 6110 chain.
10. Custom built trailer 35' long, 8' wide and 12'9" overall height.
11. Wheels are dual tandem and 1000 x 20.

Weight approximately 67,000 lbs.

— Announcement —

After a quarter-century of building custom chipper equipment for the forest products industry, all of which has been of a stationary design, the company has made the decision to make precision equipment — large in design for major work similar to that demanded by the forest products industry, yet mobile enough to serve the major tree company, the municipality and others with big tree removal jobs.

The Management

PRECISION CHIPPER CORPORATION

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SEE US AT MONTREAL AT THE I.S.T.C.

For More Details Circle (125) on Reply Card

Long Range Weed Control Programs

For Improved Environment

By LEO MILES
Herbicides Specialist, FMC Niagara

Left side of forest road is treated with Tandex® in test program to study effectiveness, and chemical movement. Photo three months after treatment.

Effect of residual acting (root-absorbed) Tandex® herbicide on tough phragmites weeds, left. Untreated weeds at right continue growth.

Difficult to control phragmite species, which thrives in marshy areas, present fire hazard in southern New Jersey. Effective measures have long been sought.

A SERIES OF WEED CONTROL development programs that may hold the answer to some of the environmental problems plaguing the country are now being conducted by FMC Corporation's Niagara Chemical Division in cooperation with various government agencies and private concerns.

The programs are aimed at establishing effective and practical techniques for treatments with a recently developed herbicide called Tandex[R] which has been found unusually effective in controlling many different kinds of weed species including difficult-to-kill woody plants.

The compound was cleared two years ago by the U. S. Department of Agriculture for a broad spectrum of non-crop uses. It has already shown high potential as a herbicide treatment for industrial sites, highway shoulders, railroad rights-of-way, parking lots, and military and airport installations.

Some of the studies now underway, however, extend far beyond these specific applications. They embrace not only new practices in disease and insect control, conservation and forestry, fire prevention, and halting the rapid spread of noxious weeds but also more efficient ways of applying herbicide materials.

Among the programs now in various stages of evaluation, based on Tandex treatments, the following have been disclosed by Niagara Chemical:

• **Rangeland Improvement**—Treatments at carefully controlled rates and in set patterns are being made to eliminate brush and broadleaf weeds while "releasing" desirable grass species—allowing these grasses to grow and spread for livestock forage and silage harvesting. Its unusually low order of mammalian toxicity makes Tandex of special interest in applications such as this.

Another program that is expected to receive attention is the use of weed controls in wildlife management—to improve existing environmental conditions for wildlife.

• **Forest Fire Control**—Eliminating the understory of brush, small trees and vegetation while leaving unharmed the remaining overstory—a desirable practice in forest management—is being undertaken with Tandex sprays. In the event of fire, this practice tends to trap airborne sparks and embers beneath the overstory, hence minimizing their spread.

The establishment of firebreaks

and fire areas with higher use levels of the herbicide is also being examined. Effectiveness and persistence of the control, safety, and chemical movement on or within the soil are among the factors being studied.

• **Other Forestry Practices**—Control of vegetation on forest roads with chemical treatments is being tested. These roads, which are often populated with small to moderately sized brush and young trees along their rights-of-way, serve not only as access routes but in some cases as firebreaks and back fire areas.

Usage rates that will allow the treated sites to be reforested when planning so indicates are another aspect of the program. The tolerance of forest transplants to chemical residues over a period of time is being established.

• **Disease Control**—Chemical treatments are also being developed to eradicate, at practical levels, woody species that serve as alternate hosts of certain fungous diseases. These include Berberis (barberry) species which harbor wheat stem rust and Ribes (currants and gooseberries) species that host white pine blister rust.

• **Mosquito Control**—Phragmites, a hard-to-kill reed that populates marshy areas, is the breeding home of many mosquito species. Control programs that can eliminate this weed economically and hence upset the conditions under which these insects thrive are being explored.

The effectiveness of Tandex in curbing Phragmites also suggests uses as a control of semi-aquatic vegetation in man-made waste lagoons and swamp areas. Test work in the eradication of difficult-to-kill weed species in sewage lagoons has been established in the midwest with outstanding results.

• **Stopping Noxious Weeds**—Noxious weeds have become real problems in many parts of the country. They multiply and are rapidly disseminated so that some states have passed laws requiring land owners to control these pests. Leafy spurge, a noxious weed common to North Dakota, is a typical example of the problem these species pose. It was first identified some 60 years ago growing in a Fargo, N.D., street. Today it is one of the state's most persistent and noxious weeds and infests over half a million acres of land.

Spot treatments of Tandex that can be applied by convenient hand shaker have just been introduced by Niagara to combat such species while they are still small clumps of vegetation—in fields, farm roads, along ditch banks and similar non-crop areas which, left untreated, could develop into major weed-breeding grounds.

Special application techniques have included the use of grid treatments to apply Tandex in pre-determined patterns to eliminate brush and other undesirable vegetation by vertical perculation (downward but not lateral movement in the ground). Such applications would allow certain grasses to spread over and around the treated areas for not only rangeland and forestry programs but also beautification of undeveloped areas.

Tandex is commercially available as an 80% wettable powder (80 WP) and 4% granular (4G) material for either pre-emergent or post-emergent treatments. Experimental formulations in pill and pellet form that would simplify spot treatments and eliminate drifting or blowing of material are being investigated by Niagara Chemical.

NEW 72" AND 90"

TERRAIN KING FLAIL MOWERS

The cutter with the "Quick Change" Knives

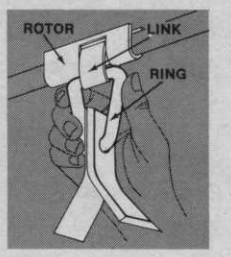
The knives in Terrain King's new Flail Mower can be changed without tools – from a selection that tailors the Flail Mower to your exact requirements. And the knives are reversible for extended service life.

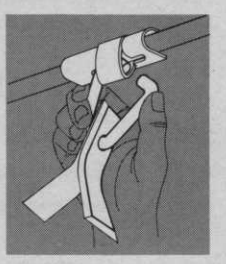
Extra heavy duty bearings and rugged frame and roller contribute to long, trouble-free life.

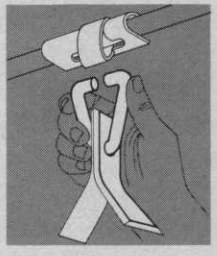
The Flail Mower is especially safe for the operator, pedestrians and property. Guards for both the drive line and the gear box are standard. The rotor enclosure and a heavy flap type deflector positively control flying debris.

The Flail Mower adjusts easily for cutting heights from 1-1/4" to 7". It is available in lift or pull models, in 72" and 90" cutting widths.

Many of your mowing needs fall easily within the Terrain King Flail Mowers capabilities. The Terrain King One Complete Mowing System, comprising a wide selection of single unit Rotary Mowers, the 15' and 25' Wide-Swath Rotary Mowers, the versatile Slopemower* and the unique RAILBIRD®, can handle the rest.







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*Slopemower and RAILBIRD are trade marks of Astron Corporation, a subsidiary of Engler Manufacturing Corporation.

For More Details Circle (110) on Reply Card

For Registration and Monitoring

Companies Spend Heavily

The outlook for new pesticides is not necessarily a bleak one, nor is it optimistic. We might call it a guarded situation. Most companies in the industry are still spending heavily.

But their major increases in expenditures are for (1) registration costs, (2) costs of maintaining approved registrations, and (3) testing and continued research on existing products. In short, the big spending is largely to protect chemicals already on the market or presently in the development stage.

Less effort apparently will be expended for (1) screening chemical compounds to determine whether they might contain some pesticidal activity and (2) synthesizing compounds for pesticidal screening — both practices related to discovery of new pesticide activity among chemicals.

These conclusions result from a survey of the industry research and development conducted by the accounting firm of Ernst & Ernst. The survey by the firm was conducted on 33 member companies of the National Agricultural Chemicals Association. The NAC employed Ernst & Ernst to collect and tabulate confidential data and make their report without disclosing information which might reveal operations of individual companies.

The firm was assisted by a task force committee of NAC directors. On the three-man team was Jim Ross, Monsanto, Ken Givens, Hercules, and R. C. Lindstaedt, Elanco. Data on the study completed in May were released in a Washington, D.C. press conference on May 26. It constituted the first specific data made available on costs in time and money for putting pesticides on the market. This report constitutes a summary of the survey as presented to the trade press. Opinions accompanying data in this report are those of the editorial staff of this magazine and were not necessarily a part of the Washington press session.

Basically, the survey covered the years 1967 through 1970, and in some

Table 1. Pesticide industry sales for 1969.

	Pesticide Sales ($Millions)
Total Pesticide Industry *	$ 851
Participating Companies **	$ 693
Percent of Total Industry	81%

* Per U.S. Tariff Commission Report 7/31/70
** 33 Participating companies

Table 2. Pesticide sales of 33 NAC participating companies.

	1967 ($Millions)	1970 ($Millions)	% Change (1967-70)
Domestic Sales	$517	$602	+16%
Export Sales	122	120	− 1%
Total pesticide sales	$639	$722	+13%

Table 3. Pesticide R & D expenditures of 33 participating companies.

TYPE OF EXPENDITURE	1967 $Million	1970 $Million	% Increase 1967-70	EST. 1971 $Million
Synthesis & Screening	$17.7	$22.0	24%	$21.3
Field Testing & Development	15.9	22.3	40%	22.7
Toxicology & Metabolism	6.9	9.1	32%	10.5
Formulation & Chemical Development	8.9	12.3	38%	12.8
Registration & Other	2.9	4.2	46%	4.3
Total R & D expense	$52.4	$69.9	33%	$71.6

Table 4. Relationship between pesticide sales and R & D expenditures of participating companies.

	1967	1970	% INCREASE 1967-70
Pesticide Sales ($Millions)	$639	$722	13%
R & D Expenditures ($Millions)	$52.4	$69.9	33%
R & D Expenditures as a Percent of Sales	8.2%	9.7%	

Table 5. Industry estimates of typical pesticide development requirements.

	1967	1970	% Increase 1967-70
Cost of Discovery & Development	$3.4 Mil	$5.5 Mil	60%
Elapsed Time from Discovery to Marketing	60 Mos	77 Mos	28%
Number of Compounds Screened for Each New Product Marketed	5481	7430	36%

instances included plans for 1971. Of total industry sales of $851 million in 1969, some 81% or $693 million was made by the 33 NAC members studied in this report.

The 33 NAC companies reported $69.9 million in pesticide research and development (R & D) expenditures for 1970. This was an increase of 33% over '67. The same group also expects to spend about $1.7 million more in 1971. But if 5% is allowed for inflation during the past year, this increase in dollar cost will actually represent a decline to about $68 million — if compared with the $69.9 million of '70.

Formulation and chemical development increased 38% from '67 through '70. Toxicology and metabolism was up about 32% and both are expected to increase during 1971. Synthesis and screening was up 24% over the three years and is expected to be down in '71.

An important measure of the degree of industry effort — for which the industry deserves commendation — is the number of man years expended for R & D. A total of 2768 man/years was applied to pesticide R & D activities in 1970. This amounted to a 17% increase over 1967. Plans for '71 would indicate almost 100 fewer man/years will be expended than a year earlier. Overall, the data indicate that the upturn in R & D in recent years has reached a plateau.

R & D activities have increased rapidly when compared to sales. Between '67 and '70 sales of pesticides were up 13%. At the same time R & D activity costs climbed 33%. Despite the inflation-effect in both figures, R & D costs were increased more rapidly than sales, all of which indicates that the industry is doing more exhaustive testing and more monitoring of existing products.

By way of summary of this point, almost 10% of pesticide sales dollars are applied to overall R & D.

NAC companies spent $16 million for regulatory maintenance (as a part of the overall R & D funding) in '70 — or about twice the level of three years earlier. Apparently, '71 will be about the same as '70.

Important in the overall picture is that new developments and new methods of research and evaluative work have made possible more sophisticated testing. These new approaches are costly and probably account for much of the increase in costs.

Another very important segment

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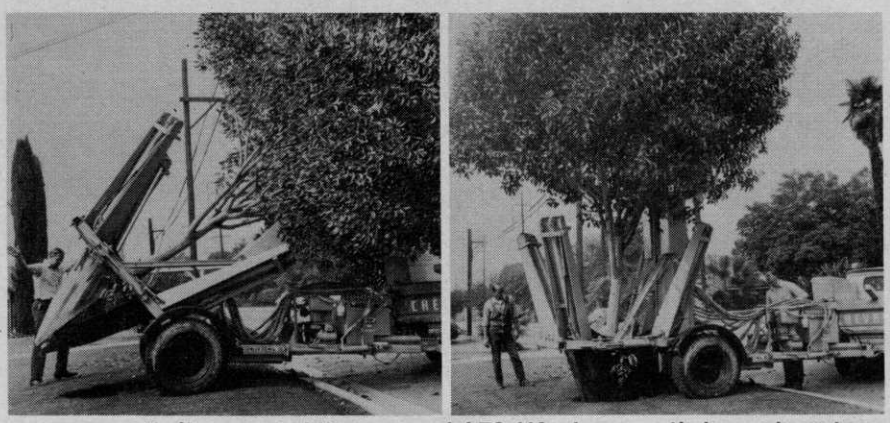

Trailer-mounted Vermeer model TS-44A, above, gently lowers large tree into previously dug hole. Instant shade . . . in minutes!

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Table 6. History of 57 products from 30 NAC companies including 22 herbicides, 20 insecticides, and 7 fungicides.

	Averaged Elapsed Time (Months)
From first screening to decision to develop	33
From decision to develop to first registration submission	19
From first registration submission to approval	11
Average R & D man/years From Screening Thru Approval	49 yrs

Table 7. Registrations cancelled or suspended for 33 participating companies.

	1968	1969	1970
Products Removed Entirely From Market	25	18	123
Restrictions Placed On Existing Registrations Which Cancel or Suspend:			
Certain Crop Applications	497	354	331
Certain Product Formulations	(D)	34	37
Use in Certain Geographical Areas	(D)	34	8
Total restrictions	717	388	376

(D) Insufficient Data

is that the companies plan to screen some 2800 fewer chemical compounds this year than a year earlier. Likewise, they will synthesize 1400 fewer compounds in seeking to identify pesticidal activity.

More R & D personnel in recent years have been added with advanced degrees. Number on company R & D staffs with doctoral degrees was up 23%, with masters and bachelor degrees being up somewhat less. Again, a minor decline is anticipated.

Pesticide development requirements in this survey are based on a summary of opinion rather than factual data. Companies in the survey put the cost of discovery and development of a pesticide at $5.5 million in 1970, up 60% in three years. They estimate some 77 months or almost 6½ years to take a compound from discovery to marketing — an increase of 28% in time over '67. The estimate of the average number of compounds which have to be screened for each marketable product is 7430 — up 37% over '67.

Key points in a summation of this industry study would seem to be that: (1) R & D costs grew faster than sales, now amounting to about 10% of total sales; (2) R & D activity has increased in recent years but a downturn is indicated; (3) Registration costs are the fastest growing segment of R & D; (4) Effort applied to R & D work to monitor current products has more than doubled since '67; (5) There is a dramatic increase in the number of products removed from market; and finally, (6) Time required for registration has increased substantially.

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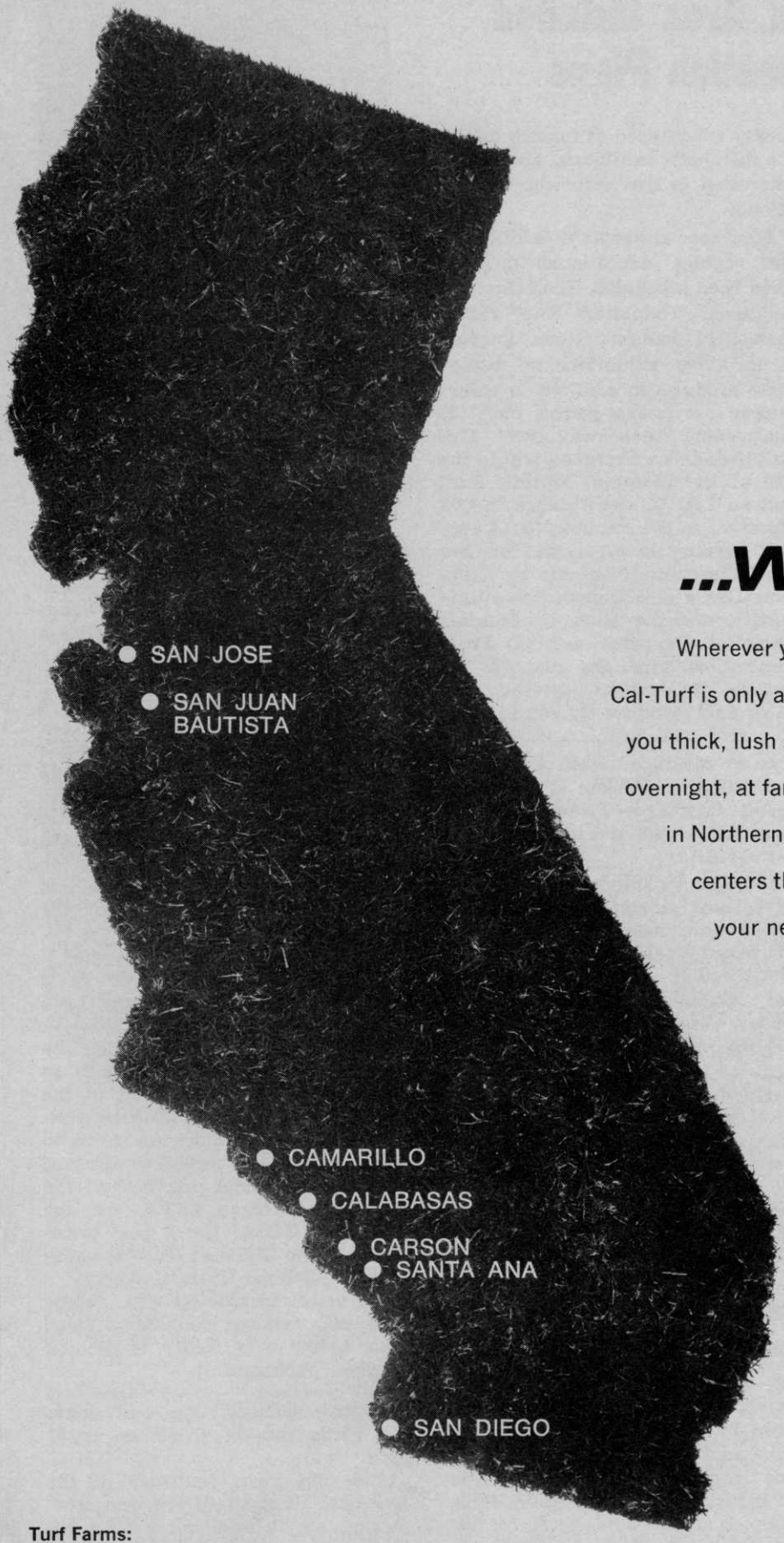
Golf Course Architect Offers Construction Article

The firm of Robert Muir Graves Golf Course Architect is offering an article published as result of a presentation by the firm to anyone associated with the golf industry.

Mr. Ronald W. Fream of the firm has announced that the article, "Build It Right the First Time," is available by contacting the firm at 3186 Old Tunnel Rd., Lafayette, Calif. 94549. There is no charge.

The original text was first presented to the 1970 Southern California Institute.



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Outdoor Demonstration Area Included ISTC Updates Its Convention Plans

Plans for the commercial exhibit at the 47th Convention of the International Shade Tree Conference this August have been updated.

Plans now encompass an outside arena both for display and demonstration of large equipment. This area will be in addition to the regular exhibit hall display section.

Other new items of news to ISTC members and guests who will headquarter for the convention at the Queen Elizabeth Hotel, Montreal, Quebec, Canada, August 7-12, include a reception party for the entire convention. This party, to be hosted by the Montreal Municipal Nursery, will be held Tues., Aug. 10, from 4:30 p.m. until 6:30 p.m. Heavy equipment may be shown at this time also, by any exhibitor who has reserved a booth at the headquarters hotel. No extra exhibitor charge will be made for this showing.

Executive Secretary E. C. "Cal" Bundy (P.O. Box 71, Urbana, Ill. 61801) is equipped to furnish details for members, exhibitors, and others interested in tree care who wish to attend.

Four special events in addition to the regular educational program have been scheduled. These are: (1) A special "Exhibitors Nite" rather than field demonstrations. Purpose is to allow exhibitors to display their products in addition to entertaining via prizes, games, etc.; (2) An evening break-away event. This will include an afternoon trip to the site of the Montreal World's Fair, and an I.S.T.C. street dance in Old Montreal in the evening; (3) A second evening is set aside for two special presentations, one by Clarence Lewis of Michigan State University, and the other by Stauffer Chemical Company; and (4) Post-convention trips are planned for Europe (2) weeks), Quebec City (overnight), and for Ottawa (1 day).

Gabriel Chemicals Acquires B. G. Pratt Company

Gabriel Chemicals Limited of New York City has announced acquisition of the B. G. Pratt Company, originator and manufacturer of garden chemicals and arborist sprays. Pratt has been in business since 1904 when the company started marketing Pratt's Scalecide.

Gabriel Chemicals is a basic product formulator in both the agricultural and industrial markets. Together, the companies have more than 300 products registered with the Environmental Protection Agency.

Executive and sales offices of both Gabriel and the Pratt Division are located at 204 Twenty-First Ave., Paterson, N. J.

NAA Establishes Fee For Home Study Course

The National Arborist Association has set a fee of $75 per enrollee for non-members who wish to subscribe to its home study program. Members pay $50.

The program consists of technical and practical aids in the field of tree care and was originally designed as a training course for tree care company staffs. It has been written primarily by staff members at Michigan State University and edited by William P. Lanphear, Forest City Tree Protection Company, Cleveland, and now president of the NAA.

Subjects include commercial arboriculture, anatomy and physiology of trees, soils, pruning of shade and ornamental trees (two lessons), identification and selection of trees, and fertilizing and watering of shade and ornamental trees.

Course kits are mailed each enrollee and under supervision of the employing firm, the student proceeds with assignments at his own optimum page. Each kit includes testing materials to be returned and graded by NAA.

Applications are available from NAA headquarters, 2011 Eye St., N.W., Washington, D. C. 20006.

National Arborists Publish Tree Care Standards

A comprehensive statement of tree care standards has been published by the National Arborist Association. The NAA for the first time is making these available to the industry as a single publication.

Copies are available at $4 for the complete set of four Standards which includes (1) pruning, (2) bracing, cabling and guying, (3) fertilizing, and (4) lightning protection installation systems. Copies of single standards remain available at $1 each.

Freeman Parr, chairman of the association's standard practices committee, and a number of NAA arborists have recently completed an update of these standards which makes the new publication an asset to the industry.

Norman W. Kramer

Norm Kramer Suffers Fatal Heart Attack

Norman W. Kramer, golf course superintendent at Point O'Woods Golf and Country Club, Benton Harbor, Mich., died suddenly June 3 of a heart attack. He was 44.

Kramer had just completed a tenure as president of the Golf Course Superintendents Association of America. During the past 13 years, Kramer shaped Point O'Woods into peak championship condition for the 1963 and 1965 Western Golf Association Amateur Championship tournaments. He was in the midst of preparing for the 1971 Western Amateur, which is being held on July 28 through August 1.

Kramer has been active as a member and leader in many local and regional turf and superintendents' organizations. When he left Illinois for Point O'Woods in 1959, he was vice president of the Midwest Golf Course Superintendents Association. Since his move to Michigan, he has served as director, vice president and president of the Western Michigan GCSA and the Michigan GCSA. He is past president of the Midwest Turf Foundation at Michigan State University.

Survivors include his wife, Peggy, and two teenage daughters, Lauri and Lynn, who reside in Benton Harbor, Michigan.

Industry Glossary Available This Month

"Technical Glossary of Horticultural and Landscape Terminology," a new hard cover publication is slated for completion this month.

Published by the Horticultural Research Institute, it contains more than 2100 horticultural and landscape terms, plus more than 700 meanings of botanical names. The new glossary promises to become a major reference work for the industry as well as for consumers.

President of HRI, R. E. Brown, whose organization led in development of the book, reports that most of the compiling was done at Pennsylvania State University. Frank A. Burggraf, professor of landscape architecture at Penn State and students in the department spent 18 months compiling words, terms and definitions. Industry leaders and other university personnel reviewed the work in progress as well as making contributions. Associations concerned with tree care, landscaping, sod production, nursery business, and others also contributed to the publication which concerns each of them.

The technical glossary will be made available by HRI at $9.95 per copy. However, prepublication orders are priced at $7.50. HRI headquarters is located at 835 Southern Building, Washington, D. C. 20005.

Gypsy Moth Infestation Found In Florida

The gypsy moth has hitchhiked into Florida via a mobile home. Egg masses were discovered late last year attached to the housing unit in a trailer park at Pensacola. The unit had been moved to Florida from Connecticut. This season—May 5—an infestation was found and the entire trailer park area is undergoing an emergency treatment program.

Officials of the USDA's Agricultural Research Service report the area is being sprayed with carbaryl. An intensive survey program is also underway in the Pensacola area.

Seriousness of the situation can be gleamed from the fact that gypsy moths defoliated more than 800,000 acres of woodlands in the Northeast last summer. This more than tripled 1969's defoliated acreage and is six times the amount of damage caused in 1968.

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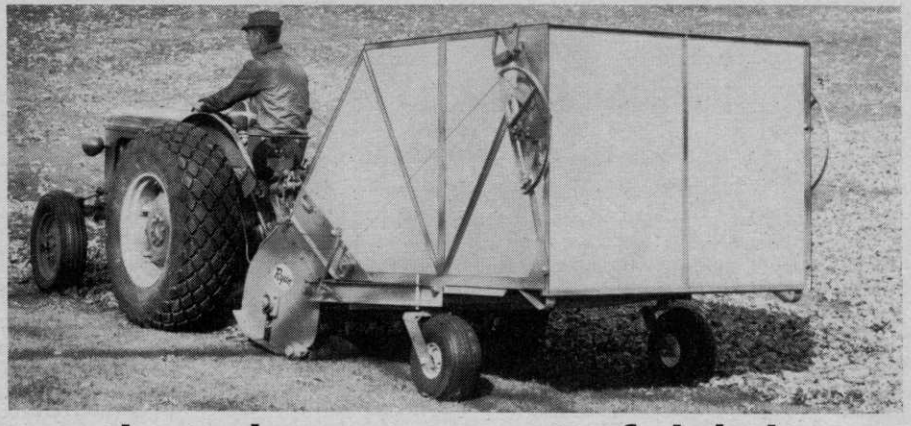
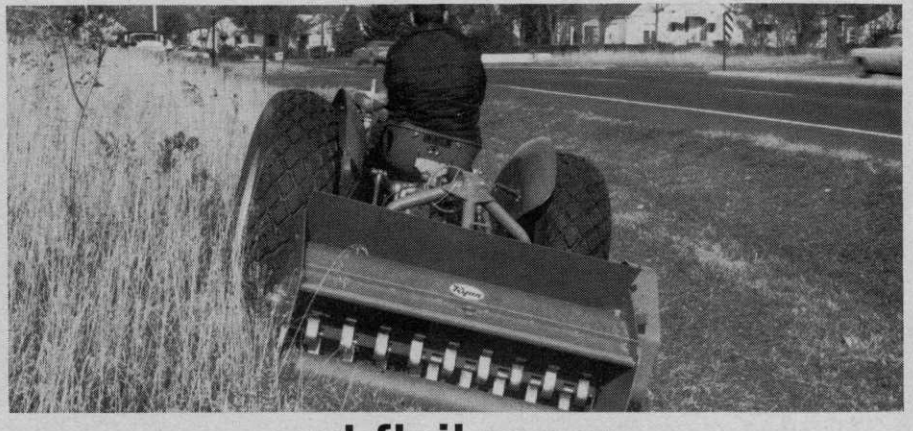


that also sweeps turf debris



...and flail mows.

Got an acre or more of turf to maintain? Then you need the Ryan Grounds Groomer. It dethatches, sweeps and mows large turf areas. Even prepares seed bed for overseeding.

The tractor-drawn Grounds Groomer has vertical blades that slice and literally blow lifted thatch, leaves, twigs, pine needles and cones, and other debris into the big 5-cubic-yard hopper. Even picks up eucalyptus leaves.

Reel is designed to dethatch while mowing. Reel is easily converted for complete flail mowing of rough grass. Reel can be raised or lowered from the tractor seat... and hopper can be dumped. Use the versatile Grounds Groomer all seasons for general turf maintenance.

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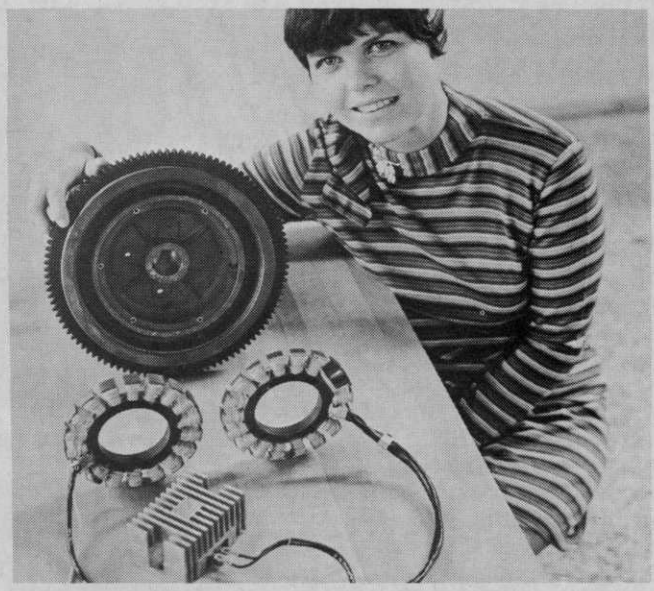
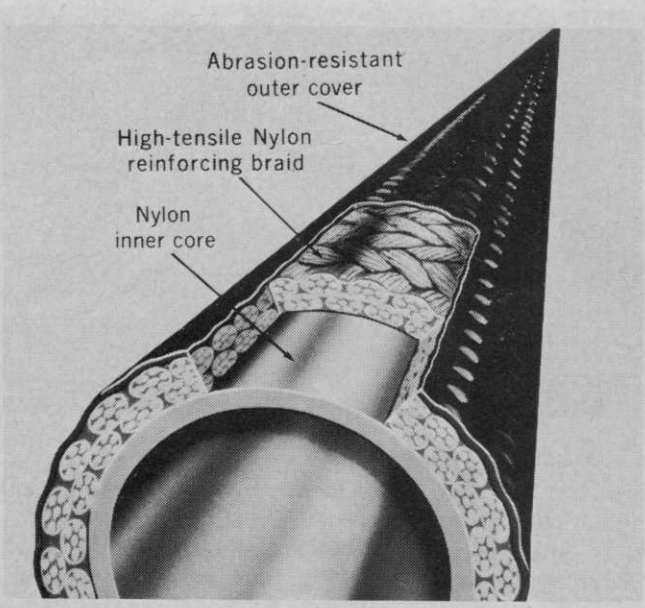
PLASTIC NETTING FOR EROSION CONTROL: Conwed Corp., St. Paul, Minn.

Oriented polypropylene netting used in many erosion control applications is but one product featured in new brochure from Conwed. Booklet gives technical details on the full line of plastic netting. Oriented and unoriented plastic netting, lay-flat tubing and rigid tubing are described. Sections on each area include such information as strand counts, hole size, weights, roll widths and diameters. For more details, circle (701) on the reply card.



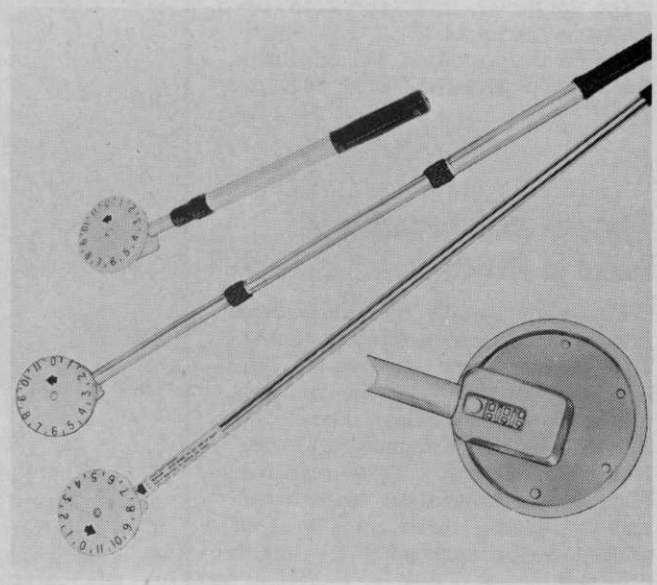
ALTERNATOR SYSTEM: Kohler Co., Kohler, Wis.

A 15-amp alternator system now is standard on four-cycle Kohler engines from 6-HP to 14-HP. Provides more electricity for accessories offered on today's engine-powered equipment. To achieve the higher output, Kohler incorporated ceramic magnets and increased number of coils in the alternator. Of the 18 coils in the alternator, 16 generate electricity for battery, lights, and accessories, and two of the coils power the triggering device on engines equipped with breakerless ignition. Regulator-rectifier, which converts the AC output of the alternator to DC, also controls the charging rate for the battery, providing a fully-regulated system. For more details, circle (702) on the reply card.



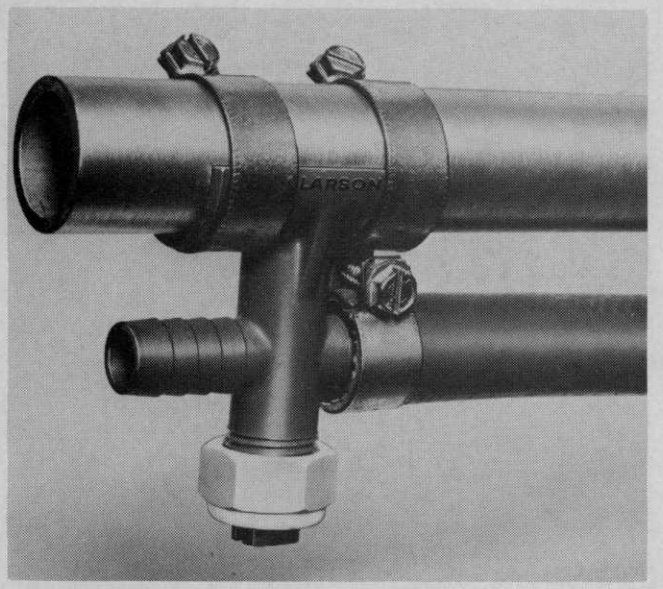
NYLON HOSE SAVES WEIGHT: Aeroquip Corp., Jackson, Mich.

Low-cost nylon hose has been developed by Aeroquip Corp. for use on hydraulic and other fluid-carrying applications. Available in both double and single braid constructions. Double braid hoses have blue thermoplastic tubing, designed to meet or exceed SAE 100R7 specifications. Available with black perforated outer cover or orange non-perforated outer cover for applications near high voltage lines. Both tested at +150° F for 1000 hours in most commercial hydraulic fluids without swelling or degradation. Temperature range for continuous service is —40° F. to +200° F. FC120 Hose is available in 3/16" through 1" sizes; FC172 Hose, in ¼" through ½" sizes. For more details, circle (705) on the reply card.



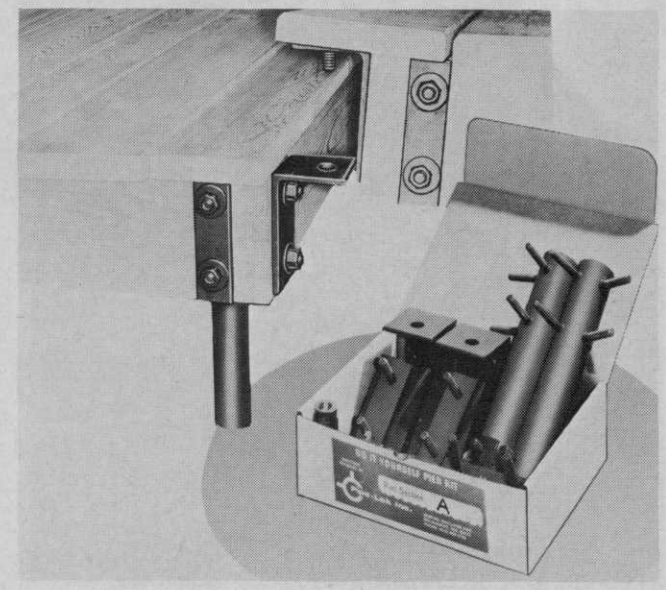
MEASURE METER: Industrial Specialties, Northridge, Calif.

Meters are composed of a 36" rod-handle with plastic hand-grip used to push a 4-inch measuring wheel, to which a footage meter is attached. Manufacturer claims accuracy to within one inch in measuring distances from one inch to 1000 feet. After making necessary measurements along any straight path, around curves, up or down walls, across ceilings, over smooth or rough surfaces, the meter is read, then can be instantly reset to zero with the touch of a button. Made of aluminum and impact-resistant plastic for exceptionally long wear and light weight (only 16 ounces). For more details, circle (706) on the reply card.



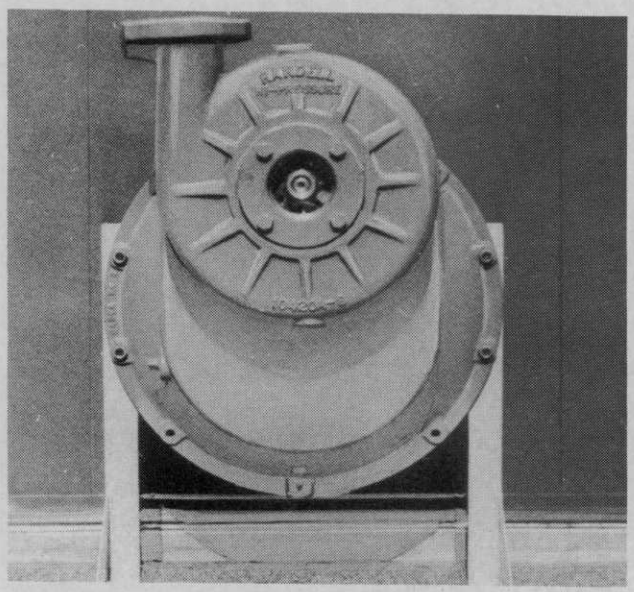
NEW UNI-NOZZLE: Larson Machine, Inc., Princeville, Ill.

Un-Nozzle revolutionizes boom spraying. Handles any chemical or liquid with non-corrosion, rust-proof nozzle. Made of polypropylene fiber-glass. Ultra-light weight giving perfect balance which eliminates spray boom misalignment and twisting. Easy to install, permits variable spacing. Snap on and tighten with hose clamps. Can be positioned in-line, at bottom of spray boom at any side angle or top of boom. Universal for use on any type tip, flood jet, flow regulators, and for drop or KLC. Tee features large ½" spuds. For more details, circle (703) on the reply card.



PIER AND BRIDGE KITS: Pipe-Lok, Inc., Milwaukee, Wis.

Small, utility piers, docks and bridges quickly and permanently assembled with Pipe-Lok Pier and Bridge Kits. Recommended for reasonably shallow and calm water installations and for bridging small streams, ponds and gullies. Includes all locking, securing and bracing hardware needed to assemble heavy duty, 8-12 foot sections, using ordinary tools. User provides wood stringers, decking and inexpensive 1¼" I.D. (1⅝" O.D.) standard galvanized support pipe to suit requirements. Adjustable (10" vertical variance) locking device and supporting hardware bear up to 3000 lbs. of dead weight. For more details, circle (704) on the reply card.



SPRAYMAN'S PUMP: Randell Manufacturing Company, Woodlake, Calif.

Dependable pump for spray equipment is the Randell, custom designed, centrifigal, single stage, high pressure pump. It has a spring loaded seal that requires no packing or lubrication. Bearings are heavy duty, deep groove, precision ball, with built-in seal. Machined and balanced silicon bronze impeller runs on stainless steel shaft. Few moving parts. Control valve, connected with by-pass valve protects the pump and seal from excessive pressure. For more details, circle (707) on the reply card.

INVISIBLE GLOVE CREAM: Ayerst Laboratories, New York City.

Kerodex®, a protective barrier cream, is available in two formulations No. 71, a waterproof cream, to help protect hands against skin irritations that may occur from the use of liquid fertilizers and insecticides and No. 51 to help protect hands against possible harmful effects of dry fertilizers. Both are greaseless and stainless. For more details, circle (708) on the reply card.

"TURFLINE" SPRAYERS, F. E. Myers & Bros. Co., Ashland, Ohio

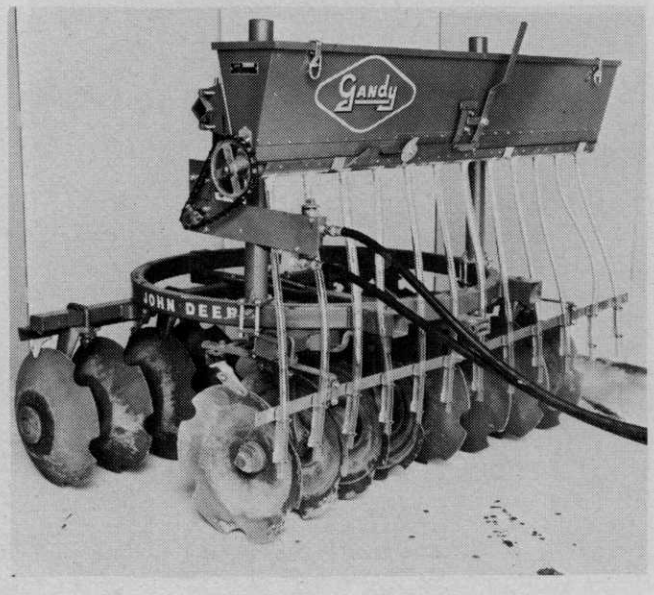
New line of boom and gun power sprayers for weed, fungus, and insect control. Includes sprayers recommended for chemical spraying wherever large areas of turf must be maintained. Also designed for mosquito control, tree and shrub care and right-of-way maintenance. "The Greens Sprayer" (Model # TL10ETMG), to cite one example, features adjustable fast hitch, permitting it to be used with drip-proof diaphragm check nozzles, and folds on arresting hooks for compact storage. For more details, circle (709) on the reply card.

HYDRAULIC SEEDING AND MULCHING MACHINE, Toro Mfg., Minneapolis, Minn.

New line of hydraulic seeding and mulching machines, called EVCO-U (Environmental Control Unit), developed for rapid and efficient seeding, sprigging, mulching, watering, fertilizing and fire-fighting on various types of terrain. Four models — 3000, 1500, 1000 and 500 — gallon working capacity units. Available on tandem axle trailer or skid mount. Handles full acre in single pass. Greater acreage-per-load possible when machine is used for seeding, using only water, seed and fertilizer. All models have four nozzles as standard equipment for close, medium and long-distance spraying and all have hydraulic direct drive. For more details, circle (710) on the reply card.

Mini-Sabre Mower, Solo Motors, Newport News, Va.

Sole distributor of Pennsylvania Power Mowers, including Mini-Sabre. Padded seat and seat back. Combination foot clutch-brake conveniently located for easy, speedy use. Will cut ¾ acre per hour. Available with or without electric starter. Four additional models available. For more details, circle (713) on the reply card.



BROADCAST GRANULAR APPLICATOR, Gandy Co., Owatonna, Minn.

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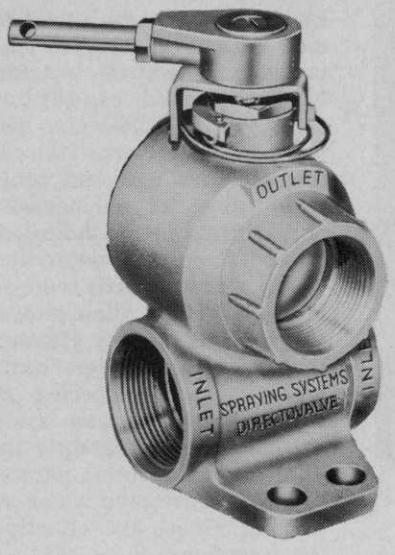

RACHET HANDLE DIRECTOVALVE: Spraying Systems Co., Bellwood, Ill.

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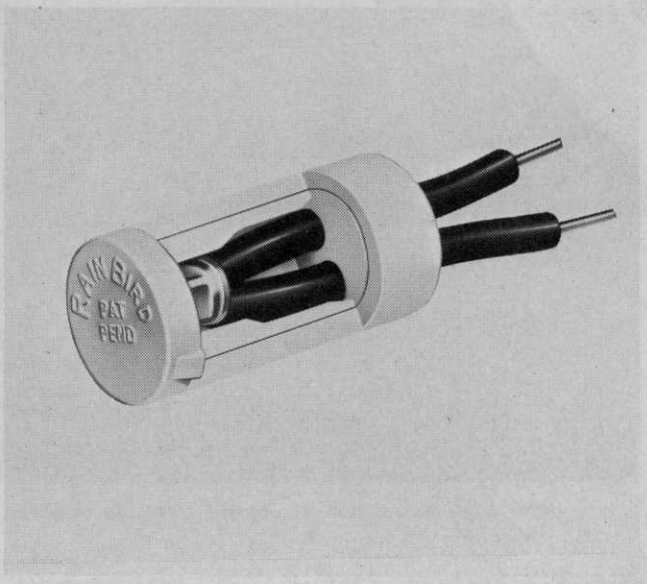

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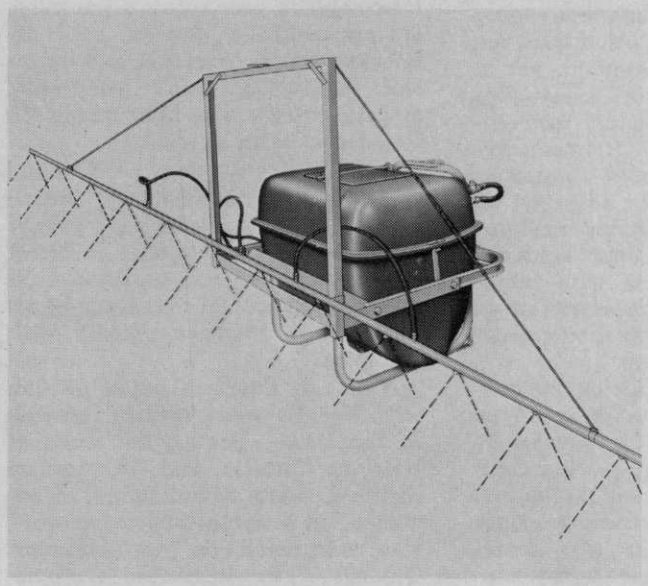

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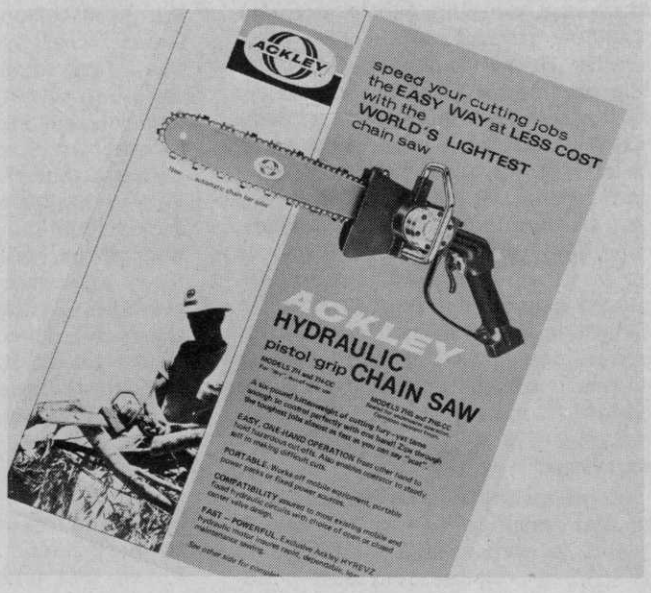
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Most common method of aquatic pesticide application is airboat.

Gallagher *(from page 18)*

Sago pondweed and other potamogeton species still constitute a severe problem in the waters of the western irrigation systems. The partially-satisfactory aromatic solvents with their inherent danger to fish are being used, but search for a better solution continues. New herbicides are constantly being screened and new application techniques have been developed to make the current materials more same. Work pertaining to nutritional requirements for establishment and the physiological aspects of temperature and planting depths is under way on several submersed weed species. Bruns (7) showed that acrolein applied at 0.6 ppmw volatilized as the treated waters moved downstream. Calculated losses were equal to 22% at one mile, 53% at 3 miles and 98% at 19 miles. Weed injury was still occurring at mile 18. Hathrop (8) reported that a low-rate long-contact period of acrolein application had been successful in the Columbia River Basin Project. Concentrations of 0.1 ppmw over a 48-hour period provided excellent control of sago pondweed in canals carrying 300 CFS and in laterals carrying 150 to 300 CFS.

Copper sulfate is being used in a similar manner to control higher plants as well as algae. Bartley (9) controlled both sago and leafy pondweed over several miles of ditch with daily applications of 0.5 ppmw copper sulfate. A 6- to 8-week treatment period was needed to produce the desired effect. Of importance here was the lack of copper build-up in canal-bottom soils. Apparently pondweeds extract copper efficiently from treated water. With a single dump application of 411 lb. in a 411 CFS flow canal (standard algae control rate is 1 lb./CFS) Bruns (7) found that 95% of the copper in 23 miles of canal was sorbed by suspended particles which dropped to the bottom and re-released the copper. No build-up occurred. In neither test were fingerling trout injured.

Riemer (10) partially filled a void in the knowledge of the action of copper in his work dealing with the behavior of copper sulfate in small ponds. He verified the ability of plants to keep the copper suspended when he showed that a heavy bloom of algae reduced the amount of copper in the water. He also showed that larger granules which sink to the pond bottom permit less copper sulfate to get into solution than the theoretical expected amount, yet at the same time that part which goes into solution mixes rapidly throughout the water system. Riemer's hypothesis that the copper applied as large granules may be adsorbed on the bottom muds possibly explains why Ware felt he had achieved more effective control with larger granules. Perhaps concentration at the stem-root zone permitted greater adsorption by the plant.

Much additional work on the control of submersed species is in the literature and more is yet to be reported. This work varies from cultural characteristics of individual species to broad-spectrum response to herbicides. Riemer (11) determined that under New Jersey conditions cabomba *(Cabomba caroliniana)* over-winters primarily as vegetative portions of the plant. No viable seed was produced either in the laboratory or in field experiments. In the laboratory test optimum growth occurred at pH 6.0 in aerated water with low levels of calcium.

In terms of new chemicals or new uses for old chemicals total water treatments of diuron, endothall dihydroxy aluminum salt, Fenac, and dichlobenil control submersed species. Walker (2) reported that diuron in gelatin capsules weighted with sand controlled cladophora and spirogyra in cold-water ponds for three months. Pierce (13) and Hambric (14) had excellent control of a wide range of submersed species with diuron. Pierce indicated that at 0.6 to 1.0 ppm myriophyllum, eleocharis, and acicularis were resistant. Most of the filamentous algae appeared susceptible. Hambric found that 2 lb./surface acre controlled a wide range of species, dispersal throughout the water system was excellent, and apparently there was immediate absorption with resultant kill since extensive water exchange did not reduce the effectiveness of the treatment.

In current Amchem research Fenac applied at the 1 to 5 ppmw needed to provide disappearance information for label purposes controlled many submersed aquatic species, particularly pondweed, and also the fringe growth of cattails *(Typhus* spp.) commonly found around ponds.

Dichlobenil studied more for the control of emersed than for submersed species was applied preemergence to Illinois ponds in December by Hiltebran (15). Rate of 16 to 20 lbs. prevented the growth of *Potamogeton pectinatus;* lower rates did not control *P. foliosis.* Yeo (16) knocked down American and curly-leaf pondweed, small pondweed, elodea, cattail, and cladophora in four weeks with 10 lb./A.

Regarding endothall, Patterson (17) refers to the dihydroxy aluminum salt as a particulate carrier which brings the herbicide in direct contact with aquatic weeds. Cortell (18) confirmed the advantage of its direct and prolonged contact with the plant.

Although this is a paper dealing with aquatic weed control research in the United States, the work of Wile in Ontario and Thomas on Prince Edward Island should be included. In both instances the work was stimulated by use demands. Ontario Water Resources Commission maintains aquatic weed research studies for answering the many requests for assistance in maintaining provincial farmponds and recreation waters. Thomas, Fisheries Research Board of Canada, worked out the details for 2,4-D granular control where eelgrass *(Zostera marina)* had become a severe problem in maritime province oyster beds.

The association of aquatic weeds and high nutrient levels in polluted

waters has stimulated interest in that relationship. Investigating the effects of pollution on aquatic growth and development, Denton (19) selected three species: alligatorweed *(Alternanthera philoxeroides)*, parrotfeather *(Myriophyllum brasiliense)*, and water hyacinth *(Eichhornia crassipes)* growing in polluted and unpolluted waters. The plants were analyzed for ash, carbon, nitrogen, phosphorus, calcium, magnesium, potassium, and sodium. Samples of water and bottom muds were analyzed for the same elements. Plant ash varied with water hardness but the carbon content differed little with the environment. Plant nitrogen, magnesium, and sodium varied considerably with the concentration of these elements in the water and bottom soils. Riemer (20) analyzed 30 species of aquatic plants and their surrounding waters, checking 12 chemical elements. The data was recorded but not interpreted. Ryan (21) reported the effects of fertilization on the growth and mineral composition of anacharis, two myriophyllum species, and *Potamogeton* pulcher. In a two-year study the four species showed unlimited consumption of nitrogen, phosphorus and potassium when fertilized. Anacharis and *Potamogeton pulcher* fertilized showed significantly higher yields than in control pools. Unfertilized *Myriophyllum spicatum* produced the greater yield. *Myriophyllum heterophyllum* responded to fertilization in 1967, but not in 1968. This effect of excess nutrients was evident at Ft. Lauderdale where it was found that high levels were toxic to hydrilla.

The current indication is that more work will be done on this aspect, stimulated in part by attempts to utilize aquatic vegetation as a feed supplement, and also the possibility of utilizing aquatic plants to trap excess nutrients in runoff water.

Otto (22) used nitrogen and phosphorous at two enrichment levels but did not increase the total vegetative mass of *Potamogeton nodosus* or *P. pectinatus*. The two species have low nutrient level requirements which are met primarily by the parent vegetative propagule.

Emersed Weed Species

In the United States the most important emersed aquatic weed species are water hyacinth *(Eichhornia crassipes)* and alligatorweed, both serious problems in navigable waters. Research for controlling these weeds is also important because mats of them provide ideal mosquito-breeding conditions. The phenoyx compounds seem to offer the best control, 2,4-D for water hyacinth and 2,4,5-TP (silvex) for alligatorweed.

Among new chemicals, in the water hyacinth work by Weldon and Blackburn (23) 3 lb./A ametryne was very effective. Associated residual studies showed that at that rate ametryne remained in the water in the treated area for 32 days. The problem of drift to susceptible crops precipitated work with ametryne. To avoid the hazard of drift and also of volatility Ball shifted to an oil-soluble amine form of 2,4-D applied through the Microfoil boom for treating hyacinths in the Loxahatchee Reservoir, situated in the center of the vegetable growing area around Lake Okeechobee in Florida.

Alligatorweed is still included in test programs because we do not have a herbicide that is satisfactory in all situations. Weldon and his co-workers (24) found that 5 and 10 lb./A of granular dichlobenil controlled rooted emersed plants, but not floating ones. Spencer (25) reported that 12 lb./A of silvex plus 3 lb. ai of amitrol-T maintained 40% control of alligatorweed after a 12-month period. In an all-out attempt to eradicate alligatorweed in a California test, Pryor (26) achieved complete kill with a drench of 1 qt. of Vampam plus 1 gallon of weed oil in 25 gallons of solution per 100 sq. ft.

Although a few years ago 8 lb./A of 2,4-D seemed to be controlling water chestnut *(Trapa natans)*, resurgent and spreading infestations are now requiring further research. Results of a test program started in 1965 by Steenis and Elser (27) indicate that mixtures of 2,4-D and dicamba applied to immature developing seeds cause these to rot. Seeds treated at maturity are sterilized. Treatments made before flowering had no effect on the seed viability or development.

In the lily family a two-year test program conducted by Weldon and Blackburn (28) showed that 4 lb./A of dichlobenil applied in summer to early fall produced 90% control of fragrant white waterlily *(Nymphaea odorata)* and was more effective than in 8 lb./A rate applied during the winter. Taylor (29) agreed with Weldon and Blackburn on white waterlily, but suggested that 10 lb./A be used for the complete control of spatterdock *(Nuphar advena)*. The best applica-

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tion time in the southeastern states was during the period of active growth. Comes and Marrow (30) recorded 99% control of white waterlily three months after Aril treatment with 7.5 and 15 lb./A of dichlobenil. Riemer (31, 32) investigated the effects on spatterdock of varying frequencies of defoliation, of a combination of defoliation plus 2,4-D, and of the effects of 2,4-D plus ETHREL (2-chloroethylphosphonic acid). He reported that defoliation depleted food reserves, the greater loss being associated with the greater number of prunings. Three trimmings plus 40 lb./A 2,4-D BEE provided complete kill with no regrowth the year following treatment. The addition of ETHREL to 2,4-D as a tank spray mix or as a separate application using 4 lb. of 2,4-D plus 6000 ppm ETHREL provided complete knockdown. A later check of the plot area revealed that the rhizomes from the treated area were unhealthy and spongey-looking, while those from the check plots and 2,4-D along were healthy and sprouting.

Ditchbank Weed Control

Ditchbank weed control retains high research priorities because of the intensity of irrigation and drainage area problems. The USDA-ARS aquatic and noncrop weed control groups are working on the major weed species such as reed canarygrass *(Phalaris arundinacea)*, carax and hardstem bulrush *(Scirpus acutus)*. Much of the work is investigating physiological aspects. The growth habits of problem plants and their place in the succession of vegetation as well as their competitive characteristics are being studied quite intensively. Of particular importance are the ecological studies which show changing weed populations.

Discussing the joint problem of reed canarygrass control and plant succession Hollingsworth and Comes (33) showed that applications repeated up to five times produced better kill of reed canarygrass than single applications of a higher rate. They also reported that amitrol-T was superior to amitrole alone. Plant succession favored establishment of bluegrass and redtop over a naturally-occurring weed mixture. Oliver (34) noted excellent control of annual broadleaf weeds and good grass tolerance with 0.25 lb./A of picloram and with a 1.4 lb./A of fenac on irrigation rights-of-way. The effectiveness of these materials suggested a 2-year weed control period might be possible. Kemper (35) controlled headstem bulrush with treatment rates of 2.2 and 4.4 lb./A methanearsonate. Spring treatments were superior to those in mid-summer and early fall. The spring treatment showed less than 10% regrowth in the second year. McHenry (36) verified Kemper's results but preferred mid-summer application. In McHenry's test, 1 lb./A of DSMA was second to the 2 lb. rate of a low volatile ester of 2,4-D. 2,4-D is an effective treatment, but drift is an inherent danger to susceptible crops.

Herbicide Residues

The question of pesticide residues is becoming the most critical aspect of aquatic weed control. With chemical methods the concern is the herbicide itself. With mechanical methods it is the re-release of nutrients into the water, creating more favorable environments for weed re-establishment. We must know the degradation and disappearance time of any herbicide placed in water, and also residues in fish and bottom organisms which make up the biological food chain.

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Averitt (37) recorded a decreasing herbicide concentration over a 22-day period when 2,4-D dimethylamine sale was applied to Louisiana waters. Initial concentrations went from 189 and 269 ppm to 19 and 10 ppm. Daly, Funderburk and Lawrence (38) showed a differential disappearance of paraquat, diquat, and 2,4-D BEE applied to Lake Seminole for the control of Eurasian water milfoil. There was only a trace of paraquat and diquat after 24 hours but the 2,4-D formulation lasted through the 7-day sampling period. All materials controlled the weed. Paraquat residue was higher in soil and milfoil than in the water. The 2,4-D formulation prevented reinfestation for a much longer time. This data in part verifies the earlier work of Frank (39) who found that 1.33 ppm initial concentration in a still pond was reduced to 0.019 in 19 days and 0.001 ppm ibn 36 days.

The USDA-ARS group is most active in this aspect of aquatic weed work, having endothall, dichlobenil, 2,4-D, amitrole, TCA, ametryne and acrolein under test either as direct application to water or as indirect application associated with ditchbank spraying. Dyes have been used to study channelling as well as stratification of substances introduced in to canal waters. The dilution factor is of most concern in moving waters. Dyes have also been used by Steenis and others in determining flow currents associated with using diquat and 2,4-D amine salts in back coves of Chesapeake Bay tidal flats.

Sheer volume is a major problem with mechanical harvesting of aquatic weeds.

The second aspect of herbicide residues associated with aquatic weed control pertains to those waters used for crop irrigation. Two USDA facilities, both in the Western Irrigation Region, are studying the effects on crops of known quantities of herbicides applied in fixed volumes of irrigation through both sprinkler and furrow methods. The crops being studied represent the crop grouping established by the U. S. Food and Drug Administration and include sugar beets, beans, corn, wheat, and potatoes. These experiments are generally carried through to yield to determine cumulative ef-

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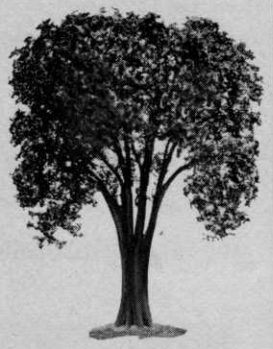

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fects as well as immediate formative effects. At the present time acrolein, silvex, 2,4-D, fenac, amitrol-T, picloram, and pyriclor have been tested either by Bruns at Prosser, Washington or by Hodgeson at Bozeman, Montana.

Biocontrol of Aquatics

Because of the lack of specialists, it appears that aquatic weed research people are having to wear several hats.

In line with this philosophy is the biocontrol work under way at the USDA station at Ft. Lauderdale, Florida with snails; a tilapia study in California; and a manatee and beetle program in Florida.

Reviewing the animals which were under study as aquatic phytophagous agents Butler (40) referred to insects, molluscs, fish, ducks, and manatees.

Florida is "where the action is" at the present time. In this state the snail, the flea beetle, and the manatee have been utilized to control submersed weeds and alligatorweed. Blackburn and Andres (41) indicate that the snail *Marisa cornvarietis* L. is quite hardy, surviving in a temperature range of 48 to 100° F, can live in polluted waters, and can tolerate a salinity of 2500 ppm. The snail feeds quite actively and is indiscriminate in its eating habits. This is an advantage in that it will keep all vegetation down. Marisa also feeds on disease-bearing snails without transmitting diseases harmful to man, an additional benefit. The disadvantage is that marisa could feed on aquatic crops, such as rice, waterchestnut, and watercress. Perhaps the greatest problem will be producing enough snails to be of value in the area where they will adapt. Field tests show that fairly high populations are needed—8000 per acre stocked in Florida cleaned up ponds and kept them clean over a two-year period.

The so-called mighty mite of biocontrol is the flea bettle *(Agasicles* n. sp) with its single-minded food habit. It apparently lives only on alligatorweed. This insect, imported through the USDA-ARS Entomological Department from Argentina, has been released in the United States at several locations. Zeiger (42) reported successful introduction to Florida waters. He indicates the two characteristics needed—survival and rapid adaptation — were met with apparent satisfactory control of alligatorweed. Blackburn and Andres suggest that the beetle might not be the final answer since it does not prove effective in the Savannah, Georgia, program.

Mechanical Weed Control

The primary objection to mechanical control in the past has been the fact that the methods used frequently spread species which propagate vegetatively. The early collection and compressing of weed masses also returned the nutrients to the water, ultimately supporting a greater weed population. This is apparently changing. Bryant (43) discussed a new and more efficient harvester system which transports the weed mass to the shore and hauls it away. He also noted that a Wisconsin state law now requires weed removal in any weed-cutting operation. The Water Witch uses high pressure to blast weeds from swimming areas, but makes no provision for weed collection and site removal.

Conclusion

To sum it all up, one must say that there is a tremendous amount of aquatic weed research under way. More importantly, understanding of aquatic weed control is progressing to the point of our realizing the necessity of a total environment concept. Research is no longer a shotgun or hit-or-miss concept involved with only a single aspect of the problem. The realization that our natural resources will not last forever at the rate we are using or destroying them is making us all conscious of the need to act as part of a total environment rather than for individual needs alone.

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(Continued on page 49)

Three States Approve Cutrine Label For Turf and Ornamentals

The departments of agriculture of California, Texas and Florida have added the following to the registered label of cutrine sold in those states:

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Cutrine, a copper algaecide, has gained widespread popularity since it was introduced nationally a year ago. It is registered by the USDA for use in ponds and lakes. Subsequent tests have shown that water treated with cutrine, and then used to water golf greens, fairways and other turf grass areas, will not cause burning or other damage.

"There has been a concern, particularly on the part of golf course superintendents, that once they treat their water with cutrine they will not be able to use that water for irrigation," stated Dennis L. Vedder, Director of Technical Services for Applied Biochemists, Inc., Milwaukee, manufacturer of cutrine.

"Tests have proven differently," Vedder said. "But our current USDA registration does not include use on land or land crops. Thus we have gone to the individual states with our data. On reviewing the data, all three states we have contacted thus far have agreed to extend our registered usage."

One of the significant tests was conducted by John Holloway, Spring Valley Chemical Co., Grove City, Ohio. He used three to six feet diameter test plots, applying one-half gallon of cutrine to each test plot. He applied the material diluted 18:1, 9:1, 3:1 and full strength. In every case, there was no damage to the grasses of the test plot.

Paul Kerr of Dublin, Ohio, veteran golf course designer and operator, had similar success. He treated areas of fairway, fringe and green at his Twin Oaks Golf Club with concentrations of cutrine up to 100 times what is recommended for normal control of algae. There was no damage to the grasses. Kerr even noted that the treated area appeared greener than surrounding areas, possibly the result of a micronutrient value of the copper.

Kerr also treated the lake on the course with cutrine for algae. He continued to water his greens for three weeks (approximately 15 waterings) with the water from the lake. Again, no damage whatsoever.

Consumers will be made aware of the extended usage by means of stickers, outlining the non-crop uses and affixed to all cutrine containers sold in the three states.

Occidental Chemical Named Marketing Agent For Cutrine

Occidental Chemical Co., Houston, Tex., has been named major U.S. marketing agent for cutrine, an algaecide manufactured by Applied Biochemists, Inc., Milwaukee, Wis.

Applied Biochemists' President, Donald E. Seymour, explained that Occidental would sell in the agricultural, industrial, municipal and political agency markets in all but 17 Northeastern states East of the Mississippi River. Applied Biochemists will continue to service the foregoing states and the lake association, commercial sprayer, real estate development and water speciality markets throughout the country.

Occidental has named Charles Nelson as product manager for the product.

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SOD INDUSTRY SECTION

Sod Pricing Policy

Chief Industry Need

Sod growers have consistently been unable to establish firm prices for their product. In a relatively new industry, there is always the threat of price cutting in the face of any reduced demand, or in instances when there seems to be a greater supply than necessary for immediate market demands.

Henry W. Indyk, executive secretary for the American Sod Producers Association, in a recent statement to members, discussed the slow-down in the economy and a resultant reduced demand for sod in many areas. Price cutting has resulted. This trend, Indyk said, should be of considerable concern to the sod industry, particularly when cost of production is steadily increasing. Indyk points to the experience of other agricultural commodity producers when they were panicked into price cutting.

A basic problem in pricing, he further stated, is that many sod producers do not know their actual costs of production. This stems many times for having less than adequate cost accounting procedures. In order to manage a profitable sod enterprise, Indyk believes complete and accurate knowledge of all costs of production is vital in establishing a price. Because of this important relationship of cost accounting, he said, the ASPA is in the process of developing of cost accounting procedures for ASPA members.

Key questions for a producer to consider, Indyk stated, are: (1) Will the price be above or below actual cost of production; and (2) How much of an increase in volume of sales will be necessary at a reduced price to realize the same net return at the old price?

To partially answer this second question, Indyk recently sent grower members some data accumulated by Donald D. Juchartz, a Michigan State University county Extension Director. Juchartz has long worked with Michigan sod producers.

His data show that a 20% price cut (from 33¢ to 27¢ or from 5¢ to 4¢) means that a 400% increase in volume is necessary to make the same profit obtained before the price was lowered. The following table will serve as a guide for price changes:

Henry W. Indyk

Price Cut	Necessary Increase in Sales
3%	13.6%
5%	25.0%
7¼%	42.8%
10%	67.0%
15%	150.0%
20%	400.0%

The following table shows what (values are approximate) happens when the process is reversed or prices increased:

A 3% increase means the same profit on 90.0% of the same volume.

A 5% increase means the same profit on 83.5% of the same volume.

A 7¼% increase means the same profit on 77.0% of the same volume.

A 10% increase means the same profit on 70.5% of the same volume.

A 15% increase means the same profit on 64.5% of the same volume.

A 20% increase means the same profit on 57.5% of the same volume.

However, Indyk in his report also pointed out to member growers that certain developments in the economy point to a bright future. He listed: (1) Healthy advances in retail trade; (2) Upsurge in the stock market; (3) Availability of money at lower interest rates; (4) Building boom in housing; (5) Slow-down in inflation; and (6) An easing of war tensions.

These are healthy signs, Indyk believes, and should be reflected in the sod industry. Furthermore, he said, sod is a product that plays a significant role in the improvement of the environment. He pointed out the effectiveness of sod in preserving open space and the contribution it can make toward relieving some of the growing national concern about environmental improvement.

Best Commercial Display Won By Nunes Turfgrass

Nunes Turfgrass Nurseries, Inc., of Patterson, Calif., won the top award for a commercial display at the Seventh Annual Turfgrass Exposition sponsored by the Northern California Turfgrass Council.

At the Santa Clara County Fairgrounds, site of the show, the exposition honored Nunes not only for design of its booth but also for its imaginative display of products. A total of 158 exhibitors competed.

Credit for the display, according to President John F. Nunes, goes to Joe Ventura, Nunes sales representative.

John Nunes has long been active in the sod industry and is well known among growers for his Nunes sod harvester. He has been a consistent exhibitor at every field day of the American Sod Producers Association.

Some 2½ acres of Nunes sod was laid in Willard Park in a 3-day period.

Willard Park Sodded With Nunes Turfgrass

Nunes Turfgrass Nurseries at Patterson, Calif., won the bid for sodding Willard Park at Berkeley. The 2½ acre site was financed from the City of Berkeley's Capital Improvement Program and the Open Space Program of the US Department of Housing and Urban Development.

Of interest to sod growers is the thinking of Berkeley's Superintendent of Parks, Grayson Mosher, in justifying sodding over seeding to his city administration.

First, Mosher pointed out, time is a critical factor. "In the long run," he emphasized, "the cost balances itself out. If we were to seed a park, park personnel would be required to watch over the area 24 hours a day, 7 days a week, to keep dogs and people off the area until the seeding had time for adequate germination and a good stand of grass was up."

"Watering of the seeded area," he continued, "is critical too. Crews would have to be on hand to do this regular. Then, there's fertilizing and weeding to be done. On the other hand," Mosher said, "with the use of sod, the irrigation system can be used immediately and the park can actually be opened to the public in a matter of days as opposed to a matter of months with seeding."

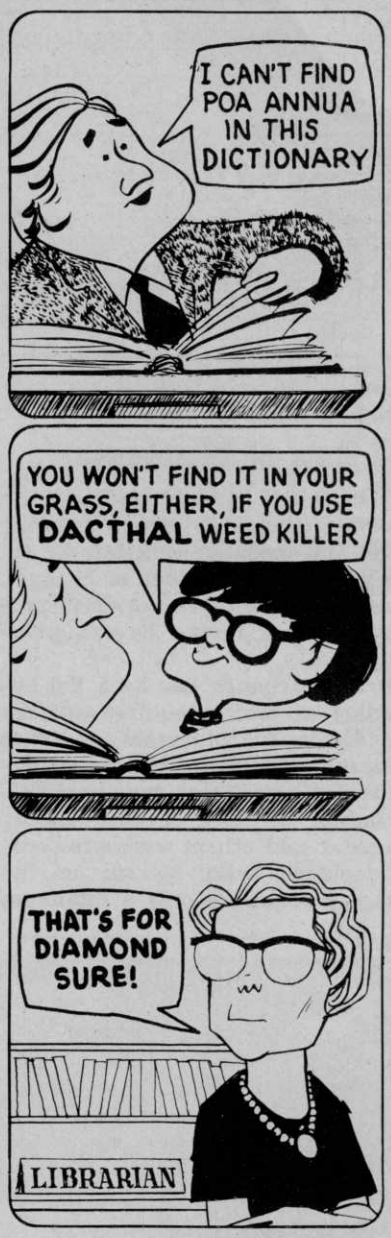
Merion Bluegrass Association Report Good Crop Outlook

At the recent 18th annual meeting of the Merion Bluegrass Association at Corvallis, Ore., reports from growing areas of the Northwest indicate a good crop for this year in all regions. New acreage will increase the coming '72 crop.

Arden Jacklin, president of Jacklin Seed Company and also president of the Merion association, was again named president for the new year. Dick Bailey, Turf-Seed Inc., Woodburn, Ore., was elected vice-president; Arnie Bonnicksen, Western Farmers Association, Seattle, Wash., treasurer; and James Eveson, La Grande, Ore., secretary. Directors are Jacklin, Bonnicksen, Bailey, Elmer Schneidmiller, Liberty Lake, Wash., Elmer Satchwell, Post Falls, Idaho, Tom DeArmond, Hubbard, Ore., George Royes, Grass Seeds, Imbler, Ore., and Ron Olsen, Madras, Ore.

Dr. John Hardison, Oregon State University, reported on new chemical studies for control of stripe smut, ergot, and others, indicating that several look promising which are mild in toxicity and could also be less expensive.

The 60 members attending discussed the merit of promoting Merion bluegrass as a base grass in mixtures. The group also decided to exhibit at the coming February turfgrass show of the Golf Course Superintendents of America. They named Spokane, Wash., as site for the coming annual meeting in the spring of '72 and voted to continue support for the Better Lawn & Turf Institute.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One early spring application is sufficient to check most weeds. But with *Poa annua* and other late germinating grasses, try a second application in late summer. Always read the label before using any herbicide.

Dacthal for turf is also available in 5% granules. Ask your dealer about Dacthal or write Agricultural Chemicals Division, Diamond Shamrock Chemical Company, 300 Union Commerce Bldg., Cleveland, Ohio 44115.

Diamond Shamrock Chemical Company

For More Details Circle (105) on Reply Card

TABLE I. STANDARDS: Seed standards for sod quality seed are as follows:

Variety	Minimum Purity	Minimum Germination	Maximum * Other Crop	Maximum *** Weed
Merion Kentucky Bluegrass	95%	80%	0.1% **	0.03%
Other varieties of Kentucky Bluegrasses	97%	80%	0.1% **	0.03%
Red Fescue	98%	90%	0.1%	0.03%
Chewings Fescue	98%	90%	0.1%	0.03%

* Must be free of ryegrass, orchardgrass, timothy, bentgrass, big bluegrass, Canada bluegrass, Poa trivialis, smooth bromegrass, reed canary grass, tall fescue, and clover.
** Other Kentucky bluegrass — Maximum 2%.
Canada bluegrass — Maximum 0.1%.
*** Must be free of dock, chickweed, crabgrass, plantain, black medic, annual bluegrass, velvetgrass, and prohibited noxious weed seeds.

Seed Standards Into Use For State of Washington

Washington state's sod quality certified standards have been revised and recently went into effect. They include a number of changes. These along with the original proposal warrant review by sod growers.

Primary change has been the upgrading of purity requirements for all Kentucky bluegrass varieties with the exception of Merion. Several of the special turf type varieties, including Fylking, Sodco, Baron, Pennstar and others were previously included with Merion in the category requiring only a minimum purity of 95%. The new requirements call for these varieties, including Fylking, to now have a minimum purity of 97% to qualify for Gold Sod Quality tags. The purity requirements for Merion will remain at 95% since there are years (hot, dry, climatic conditions) when Merion will be "lightweight" and have a higher percentage of inert material and, therefore, at lower purity.

Following are the standards set forth in the May 16, 1971 order by Donald W. Moos, director of agriculture for the state of Washington:

SOD QUALITY CERTIFIED SEED STANDARDS: The general rules for seed certification and grass seed certification standards are basic and together with the following specific rules constitute the rules for sod quality grass seed certification.

VARIETIES ELIGIBLE, CERTIFICATION FEES, LAND AND ISOLATION REQUIREMENTS, AND FIELD TOLERANCES: The varieties eligible and certification scheme of each; the certification fees; the land requirements; the isolation requirements; and field tolerances shall be as listed in grass seed certification standards.

SOD SEED ANALYSIS CERTIFICATE: A sod seed analysis certificate, which is a 25 gram purity and includes noxious, all weed, all crop, 10 gram Poa annua check, and germination, will be the basis of determining seed standards.

SOD QUALITY SEED TAG: In addition to the certification tag, seed meeting sod quality certified seed standards will be tagged with a special "Sod Quality Seed" tag.

SERVICE FEE: Service fee for sod quality seed tags and tagging shall be $0.25 per cwt.

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Gypsy Moth Creosote Again Being Marketed

Cabot's Gypsy Moth Creosote, a product originally developed by Samuel Cabot, Inc., Boston, Mass., in the 1890's, is again being marketed.

The company sold the product until development of DDT shortly after World War II. With DDT now outlawed for control, Mr. Samuel Cabot, president of the company has announced renewal of the product in the market. It is being re-registered with the Environmental Protection Agency's Division of Pesticides.

The Gypsy moth creosote product is a black liquid that penetrates completely through the nest and kills all eggs, and thereby prevents hatching of the caterpillers.

Gallon prices range from $2.35 for singles, to $1.90 for 55-gal. barrels.

(For more information, circle 717 on the reader service card).

meeting dates

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Shade Tree Meeting, Ohio Agricultural Research and Development Center, Wooster, Ohio. July 7.

Hyacinth Control Society, Annual Meeting, Manger Motor Inn, Tampa, Fla. July 11-14.

American Association of Nurserymen convention, Statler Hilton Hotel, Dallas, Tex. July 17-21.

1971 Midwest Nursery and Landscape Exposition at D. Hill Nursery, Dundee, Ill. July 25-27.

United States Department of Agriculture Turfgrass Field Day, Plant Industry Station, Beltsville, Md. Aug. 4.

47th International Shade Tree Conference at the Queen Elizabeth Hilton Hotel in Montreal, Quebec, Canada. Aug. 8-12.

American Society of Agronomy, Crop Science Society of America and Soil Science Society of America concurrent meetings in New York City. Aug. 15-20.

Penn State Turfgrass Field Day at the Joseph Valentine Turfgrass Research Center, University Park, Pa. Aug. 25-26.

National Association of Professional Gardeners, Annual Conference, Princeton Inn, Princeton, N.J. Aug. 28-30.

Michigan State Turfgrass Field Day at the Crop Science Field Laboratory in East Lansing. Sept. 9.

Alabama-Northwest Florida annual turfgrass short course in cooperation with Auburn University, Auburn, Ala. Sept. 9-10.

Florida Turf-Grass Management Conference, Pier 66, Ft. Lauderdale. Sept. 19-22.

Midwest Regional Turf Foundation field day, Purdue University, Lafayette, Ind. Sept. 27.

30th Annual Short Course for Roadside Development, Columbus, Ohio. Oct. 4-8.

Society of Municipal Arborists, 7th annual meeting, Empress Motel, Asbury Park, N. J. Oct. 6-8.

Wisconsin Golf Turf Symposium, Pfister Hotel Milwaukee, Wis. Nov. 4-5.

Arizona Parks and Recreation Conference, annual meeting, Holiday Inn, Tempe, Ariz., Nov. 17-18.

National Agricultural Aviation Association, Fifth Annual Conference, Fairmont Hotel, Dallas, Tex. Dec. 5-9.

Northeastern Weed Science Society, 1972 Convention, Hotel Commodore, New York, N. Y. Jan. 5-7.

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Lake Bottom Weed Control ARS Tests A New Method

A cutrine-diquat combination placed on the bottom of infested lake areas is doing a good job of controlling aquatic weeds in early tests.

Testing is being done by the Agriculture Research Service of the USDA at Fort Lauderdale, Fla. Botanist Robert D. Blackburn, in charge of testing at Lake Maitland, Fla., reports that the combination requires only about 10 percent of the normal cost and chemicals for control.

Early results on one-acre plots look good, he reports, but stresses that tests have only been running for six weeks.

The combination consists of 2 gallons of Chevron's diquat and 4 gallons of Applied Biochemists' cutrine, applied in the bottom two feet of water at the lake bottom. Application is made by draging hoses from a boat on the bottom of the lake. Metal pipe protruding upward from each hose releases the chemical at about two feet off the bottom.

Extremely optimistic about the process, Blackburn said that there were two surprises in the method. First was the fantastically low rate of chemical needed for control. Second was the fact that activity was produced from the diquat despite bottom residue stirred up by dragging the hoses.

There was no fish kill, and the weed desiccation was slow, both of which favor the system.

The cities of Lake Maitland and Winter Park are cooperating in the program.

Fusarium Shows Up In Michigan Sod Area

The characteristic symptoms of **Fusarium** blight, a relatively new lawn disease in Michigan, are shown here. Cool, wet weather favors the development of the fungus disease. Susceptible grass varieties include Merion and other Kentucky bluegrasses and bentgrasses.

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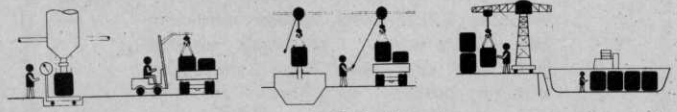

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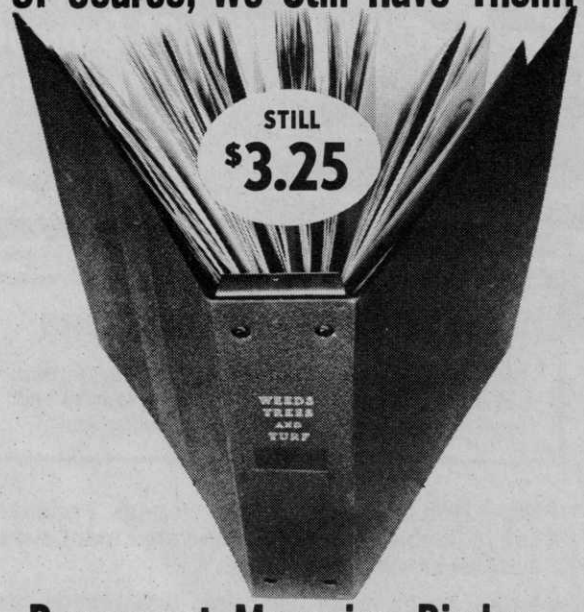

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BOOK REVIEW

ANNUALS. by James Underwood Crockett and the Editors of TIME-LIFE BOOKS. 176 pages, illustrated. Retail price: $6.95. Retail distribution: Little, Brown and Company, Boston, Mass. Library and school edition: Silver Burdett Company, Morristown, New Jersey 07960. Publication date: April 1, 1971.

ANNUALS, detailing virtually every aspect of choosing, planting and cultivating those splashes of brilliance so indispensible in a garden, is the first volume in the TIME-LIFE ENCYCLOPEDIA OF GARDENING. Its publication on April 1st initiates the multivolume series, with subsequent volumes scheduled every two months.

The author, James Underwood Crockett, draws from a lifetime of experience as a landscape consultant, horticulturist and nurseryman to guide the home gardener in the step-by-step techniques and "green thumb" secrets that insure gardening success.

The final half of *Annuals* is an illustrated encyclopedia of the annuals available to home gardeners in the United States and Canada, including biennials and those tender perennials generally grown as annuals. Each plant is illustrated in full color to show floral characteristics and leaf arrangement.

The encyclopedia contains more than 160 water colors of annual species by Allianora Rosse, a specialist in flower painting.

Annuals will be followed by volumes on roses, landscaping, lawns and groundcovers and other topics important to the gardener.

National Park Institute Set For November 15-19

Park superintendents and other professionals interested in this segment of the commercial turf industry will meet at Milwaukee, Wis., 15-19 this year for the National Institute on Park and Grounds Maintenance.

Maintenance will be stressed with the theme for this '71 event being "More Maintenance for Your Dollar."

Representatives of the Environmental Protection Agency will specify trends and new regulations in controlling many of the chemicals commonly used in ground work.

Exhibits will include new lines of coming '72 equipment and supplies with service and technical personnel manning booths.

The Institute is centrally located in the downtown area, just a block off the interstate. Headquarters will be the Sheraton-Schroeder Hotel. More information is available from: National Institute, P.O. Box 409, Appleton Wis. 54911.

Sprinkler Irrigation Group Establishes Turf Committee

The Sprinkler Irrigation Association has named a special Turf Interests Committee. Purpose will be to investigate the industry and compile all possible data relating to effective use of turfgrass irrigation.

A bibliography of all available written material concerning lawn and turf irrigation, including technical papers, magazine articles, textbooks, reference manuals, manufacturers' literature of an educational nature, and other types will be published.

Chairman is A. C. (Chet) Sarsfield, owner of Irrigation Technical Services, Lafayette, Calif. Published data and other material are being solicited by Sarsfield at P.O. Box 268, Lafayette, Calif. 94549.

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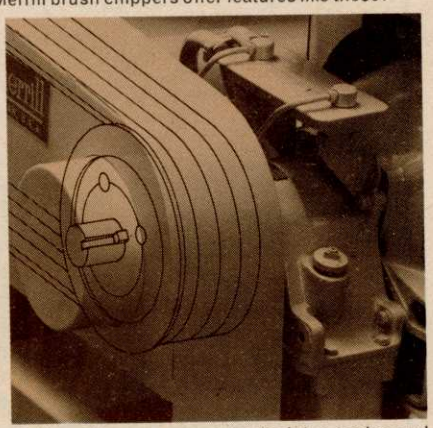

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A LIFETIME GIFT. On behalf of his company, Merck & Co., Dr. B. A. Krukoff (center) presents 30 pounds of the flowering erythrina (coral tree) seeds to the City of Los Angeles, which he collected during a recent expedition to Mexico and Central America. Accepting is Mrs. Virginia Baldwin, president of Los Angeles Beautiful, and Brad Pye, president, Recreation and Parks Commission.

Greens Superintendent Arlin Grant manually adjusts a "satellite." The clock mechanism is connected to eleven sprinkler heads, and can activate each valve in sequence. Satellites are activated according to the program set at the central control panel.

Golf Course Architect "Andy" Anderson
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Innisbrook Golf Club Installs Unique New System

Innisbrook Golf and Country Club lies in a small, distinctive region between Clearwater and Tarpon Springs, Fla. In this area abound the highest coastal bluffs in the state. The course has rolling hills that rise from sea level to 80 feet above.

Because of sand, hilltops at Innisbrook are like giant sieves. Water filters readily to cypress swamps in the bottomlands. Result is that ten times as much water is required to irrigate the porous turf on the knolls as is needed for the mucky soil in the low areas.

To solve this problem, Innisbrook developers have installed a fully automatic irrigation system with 1,000 sprinkler heads which can be individually programmed from a central control panel.

"This is an ideal system for the conditions resulting from Innisbrook's unusual terrain," Project Director Harvey Jones says. "We can deliver with precision the exact amount of moisture needed by each part of the course."

A Toro system was installed by The Wadsworth Company. Deep wells supply the water, which is pumped into Innisbrook's many lakes, then onto the course.

Turf Specialists Recommend Lawn Grass Mixtures

Turf specialists know that each grass variety reacts differently to soil conditions, management and environment. For these reasons they recommend formulations or blends of Kentucky bluegrass varieties for turf adapted to a wide range of conditions. Until now it has been impossible to produce a blend of three Kentucky blugrass varieties that are compatible in color, texture and beauty. So says Howard Kaerwer, turf agronomist at Northrup, King & Company, Minneapolis, Minn.

With the introduction of Pennstar Kentucky bluegrass, such formulas are now possible, Kaerwer says. Prato Kentucky bluegrass developed in Holland, Fylking Kentucky bluegrass from Sweden and Pennstar Kentucky bluegrass developed by Penn State University are so similar in appearance that it is difficult to tell them apart under normal lawn growing conditions. Yet due to their diverse backgrounds, each reacts as an individual to local conditions. Therefore, it is no longer necessary to establish mixtures of grasses differing in color, texture or leaf-width to gain the benefits to be derived from using formulas of grasses.

Fylking, Prato and Pennstar react differently to disease and insect problems and counteract damage. All three varieties are highly competitive and crowd out weeds. They perform well at short or long mowing heights. They react favorably to ing heights.

ITRC Proceedings Available From Davis at Wooster

Proceedings of the First International Turfgrass Research Conference are now available according to Dr. James B. Beard, of Michigan State University, who was chairman of this meeting held in England in 1969. The 610 page Proceedings is organized into subject matter areas covering all phases of turfgrass science and culture. The complete research papers of the participants and the discussion sessions are included. Cost of the Proceedings is $8.00 per copy including postage in the United States. It can be obtained by writing to: Dr. R. R. Davis, assistant director, Ohio Agricultural Research and Development Center, Wooster, Ohio 44691. Checks should be made out to the International Turfgrass Society.

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The patented side hopper of the Cut 'N Shred Shredder provides the fast and exclusive method of first cutting and then shredding the most fibrous materials, such as tree prunings, stalks, vines, etc. into desirable mulches or fertilizers. Any garden wastes fed into either hopper, comes out shredded into useable mulch or compost that is ideal for fertilizing, weed smothering, moisture retention, or winter protection. The 3½ h.p. Cut 'N Shred Shredder for only $149 will make up to 80 gallons of wood mulch per hour from tree prunings.

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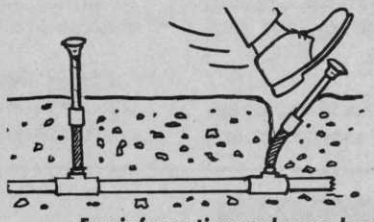

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industry people on the move

Eistein Pedersen named director of Distribution Planning for J I Case Company at Racine, from duty in Case European Operations Div.

* * *

Dr. Neil W. Stuart, ARS research plant physiologist, awarded the Distinguished Service Award, highest USDA honor.

* * *

Zoltan Merszei and Herbert H. Lyon, named vice-presidents for Dow Chemical. Merszei is president of Dow Chemical Europe S.A., and Lyon will service as assistant director of corporate administration. A. Philip Hanmer succeeds Lyon as corporate controller.

* * *

Dr. Edward F. Knipling, science advisor to ARS administration of USDA, a Distinguished Federal Civilian Service Award from President Richard Nixon, for pioneering in battle against insects.

* * *

Jerry Claussen, to Phelps-Brauer & Associates, Lakewood, Colo., golf course architects and site planners, from consultant for National Golf Foundation.

* * *

John D. Birkett and William K. Manos, to Union Carbide as technical sales representatives for the Northern Region for ag products and services; Edward B. Baskin, Jr., to similar position at Bishopville, S.C.

* * *

Dr. Walter H. Grimes, named Chemagro's director of Research and Development, from product and market development group of company.

* * *

Thomas Scrivner, to Air Rake Manufacturing Corp. as sales manager, from Manufacturers' Sales Company.

* * *

Ernest Brooks, David Jetzke, and Steve D. Keating, named district sales managers for Toro's turf products division. Brooks, to East Coast, Jetzke, the upper mid-West and part of Canada, and Keating New England and eastern Canada.

* * *

Lewis B. Bloch, elected president of Landscape Contractors Association of Metropolitan Washington, D. C. Bloch is vice president of J. H. Burton landscaping contractors.

* * *

Muryl White, appointed branch manager of Thompson-Hayward's Natchitoches, La., office, from sales representative.

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insect report

TURF INSECTS

SWEETPOTATO FLEA BEETLE
(Chaetocnema confinis)

ARIZONA: Heavy on dichondra lawns in several areas of Phoenix, Maricopa County.

A BILLBUG
(Sphenophorus phoeniciensis)

CALIFORNIA: Adults appearing in lawns at San Diego, San Diego County.

WESTERN TENT CATERPILLAR
(Malacosoma californicum fragile)

OREGON: First instars observed north of Chiloquin, Klamath County, on bitterbrush.

A WHITE GRUB
(Phyllophaga anxia)

NEBRASKA: Averaged 36.6 larvae and 13.3 adults per square yard at several locations in Cherry County. Counts lower than in 1970.

INSECTS OF ORNAMENTALS

NANTUCKET PINE TIP MOTH
(Rhyacionia frustrana)

KANSAS: Two larvae found in terminals of Scotch pine in Riley County planting.

HOLLYHOCK WEEVIL
(Apion longirostre)

VIRGINIA: Adults collected in Powhattan County May 18, 1971. This is a new county record. Previously recorded from Montgomery, Sussex, Fluvanna, Stafford, and Fairfax Counties.

TREE INSECTS

ELM LEAF BEETLE
(Pyrrhalta luteola)

OREGON: Adults in Medford and Talent area of Jackson County. Slight to moderate feeding damage reported. NEVADA: Small numbers of eggs in southern Washoe County. WYOMING: First adults on elm in Wheatland, Platte County. KANSAS: Many eggs on Siberian elm leaves on May 14 at McPherson, McPherson County. Many adults feeding on leaves. OKLAHOMA: Eggs and small larvae heavy on Siberian elm at Seminole, Seminole County. Heavy in Kay County and moderate in Craig County. TEXAS: Light and localized on elm trees in Denton County. Eggs reported as hatching; first and second instars present. MISSISSIPPI: Light to moderate on Chinese elm in Yalobusha, Calhoun, and Oktibbeha Counties.

FOREST TENT CATERPILLAR
(Malacosoma disstria)

NORTH DAKOTA: Eggs hatched by May 15 in Fort Totten area of Benson County. MINNESOTA: Eggs hatched on May 6 in International Falls area. Defoliation expected to be heavy on aspen in northern Koochiching County, and small locations in Douglas and Otter Tail Counties in 1971.

EUROPEAN PINE SHOOT MOTH
(Rhyacionia buoliana)

MISSOURI: Collected on Scotch pine at Platte Woods, Platte County, May 17, 1971. This is a new county record.

PINE NEEDLE SCALE
(Phenacaspis pinifoliae)

OHIO: First crawlers hatched May 19 on Scotch pine in Geauga County. Seriously reducing marketability of Christmas trees.

PINE SPITTLEBUG
(Aphrophora parallela)

MISSISSIPPI: Moderate to heavy on loblolly pine in Leake, Attala, Winston, and Oktibbeha Counties.

classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

Rates: "Position Wanted" 10¢ per word, minimum $3.00. All other classifications 20¢ per word, minimum $4.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment. Boldface rule box: $25.00 per column inch.

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COMPLETE new and used units and spare parts for professional grounds maintenance and lawn spray equipment. Applies thousands of gallons of liquid fertilizer, insecticide, fungicide, surfactant and weed control at one time with automated precision without refill. Unable to meet planned expansion, must sacrifice where is as is. Contact Dave Wilson or Wayne Matson 615 244-7201.

FOR SALE: 35 gallon Hardie sprayer with a 400 gallon wooden tank, mounted on a 1947 Studebaker truck. Good operating condition. $1,000 or best offer. Tamke Tree Experts, Bernardsville, N.J. 07924. Phone 201 766-1397.

VERMEER model 18, series 188, $2,800.00; 1968 Asphundh 16" 8 cylinder chipper, $3,600.00; Hardie sprayer 35 GPM (as is), $300.00; 1968 5T Alenco crane with 60' boom extension on Ford chassis, $12,500.00. Osborne Bros. Tree Service, Mentor, Ohio 44060. Phone 946-4355.

SPRAYERS, chippers, log splitters and other equipment at large savings. Let us know your needs. Equipment Sales Company, 5620 Old Sunrise Highway, Massapequa, New York 11758.

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WANTED: Top-Notch Tree-Service Salesman. The man we want has a degree in forestry or equivalent, five years' experience in selling tree work, hiring and managing tree and landscape crews, and is ready to accept responsibility and progress with a dynamic company. If you are the man, you will be well-compensated, with top salary, company car, with bonus and commission geared to performance. And a liberal pension plan. You will be proud to sell our services to homeowners, utilities, municipalities, and industries. We are one of the nation's top 10 tree care and landscaping businesses, and growing. As we grow, you grow, too. Write us about yourself or send a resume. Your reply will be treated confidentially. Write c/o Box 66, Weeds, Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

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SOD QUALITY MERION SEED for discriminating growers. Also Fylking, Delta, Park, Newport, Nugget and Pennstar bluegrasses as well as fine fescues. We will custom mix to your specifications. Michigan State Seed Company, Grand Ledge, Michigan 48837.

Wilson *(from page 17)*

per acre. It is almost impossible to apply sprays with hand-held guns and achieve uniform coverage. An alert sprayman can achieve a satisfactory degree of coverage, however it takes constant concentration.

Knowledge of the various factors that make up the mechanics of spray application will not guarantee a total absence of herbicide application failures; however, a thorough understanding of the major principles involved will increase your percentage of successes.

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Trimmings

ADVERTISING PAYS DIVIDENDS. Take the case of the G.I. in Viet Nam who saw the current Sabre Saw Chain ad which features a SABRE gal reaching for another saw. He wrote that, "I hadn't heard of your saw chains before but the girl pictured caught my eye. Keep them coming. Out in the boonies you don't see that type of female. It made the sun break through the rain for a moment."

* * *

ARBORISTS ARE ADVERTISING or at least that's the case for the American Society of Consulting Arborists. This young organization of experienced arborists is finding themselves in court on a regular basis — as technical witnesses. There's a great demand for their services to set the cost of damage claims where trees are removed, legally or otherwise. They are finding excellent response from association ads in LAWYERS WORLD and the AMERICAN BAR ASSOCIATION JOURNAL.

* * *

FEWER PESTICIDES ARE BEING USED IN THE EAST, particularly to fight gypsy moth. In New Jersey alone this year, the infested area is about 200,000 acres according to that state's department of agriculture. The Department reports that two consecutive years of heavy defoliation of oak will kill from 30 to 60 percent of the trees, depending on site conditions. And the USDA reports that "gypsy moths defoliated more than 800,000 acres of woodlands in the northeast last year. This more than tripled 1969's defoliated acreage and is six times the amount of damage caused in 1968." End of quote.

* * *

EUTROPHICATION is a 5-syllable word that a short time ago was exclusive property of ecologists and plant biologists. It means "nourishment," and especially applies to the feeding of algae floating like green scum in lakes and streams. Rutgers plant biologists are studying this so-called happening, about which they admit there is little precise knowledge to date. When phosphates and nitrogen compounds from detergents, fertilizers, industrial emissions, municipal wastes and other sources enter the water, the algae "blooms," then decays. Oxygen is depleted, and fish kill begins with the slowing down of the natural decomposition of organic matter. Copper sulphate has ben the standby control for years but the scientists, with luck, hope to measure nitrogen and phosphate levels, and seek solutions.

* * *

WE COULD BE STARVING WITHOUT PESTICIDES if we were at 1930 levels of production when they were not in use. At that time the average yield of corn per acre was 27 bushels. Today, the average is 95. The increase is not all due to use of pesticides, but they have played an important role in keeping down disease, insects, and weeds so that the chemical fertilizers could perform.

Penn State Developing New Soil Test Method

Penn State University soil scientists are developing a new method for soil testing. It will determine soil requirements — or excess nutrients — for each nutrient element.

The new test, according to Dr. E. Baker, soil chemist, will utilize a chemical solution which, when perfected, will contain the minimum amounts and balance among elements required by plants. Removal of ions from the solution by soil will indicate the need for fertilizers at a given time. The amount of each ion removed, Dr. Baker states, from the solution by the soil will show directly the requirements for a particular nutrient.

Elements being analyzed include nitrogen, phosphorus, potassium, calcium, magnesium, manganese, iron, copper, zinc, and sulfur.

The new procedure will be helpful in using waste products as fertilizers. Soils, water, and crops must be monitored constantly to insure that the quality of each does not decrease. If the new method proves superior to present soil analysis systems, it may be used routinely in five years.

The chemical solution must be perfected to the point where it will always contain minimum concentrations of the essential nutrient ions found in the soil and needed for maximum crop production. Consideration must be given to differing tendencies of various ions to be absorbed or held onto by soil particles. Once this procedure is perfected, the new approach will be ready for calibration.

K-State Offers New Hort-Therapy Curriculum

A new curriculum in horticultural therapy is being offered at Kansas State University at Manhattan. It is being done in cooperation with the Menninger Foundation.

Horticultural therapy, the reasoning goes, can involve patients in practical work in plants and plant production where jobs are available. The study leads to a bachelor's degree in agriculture.

Comment

News Item: Nurserymen and gardeners of Torrance, Calif., recently gave top soil, ground cover, trees, and shrubs valued at $40,000 plus, plus their own labor to landscape the newly built Memorial Hospital in that city. Landscaping material was the gift of the nurserymen, labor came from the Gardeners Assn.

Quotable Comment from a Businessman: "Nurserymen have donated the plant material, and somehow have managed to scrounge up enough 'free' labor to complete the landscape construction phase of the local hospital. This to the tune of $40,000! Big Deal!

"Now, I have a question. How was the rest of the project accomplished? Did the brick layers donate their time and material? How about the plumbers, electricians, steel workers, etc.?

"Of course, we all know the answer. It is the poor, nieve, nature-loving nurseryman, who can't afford to pay his help a decent wage because we are an agricultural enterprise, who places such a low value on his goods and services that he is willing to donate them for any worthy cause that comes along.

"It is high time that the people in our trade realize that we are operating a 'Business', not a benevolent organization, and that our goods and services have a definite value and must be paid for. Why do we insist on perpetuating the thought that our goods and services, somehow, are of less value than those of other trades?

"If we do not wake up to this fact, we will always be second class citizens in the business world. Edwin E. Smith, President, Smith Tree & Landscaping Service, Inc, Lansing, Mich.

Treflan's effectiveness...

can't be watered down

Elanco's Treflan® forms a dependable weed control zone that works for months, then is gradually and naturally broken down without toxic residue.

Elanco's Treflan won't leach out of its protective zone despite heavy rainfall and repeated irrigation.

Elanco's Treflan is approved for use on more than 130 species of ornamentals.

Elanco's Treflan is the only herbicide that lets you set liner stock into just-treated soil.

Can be surface applied or soil incorporated.

Elanco Products Company, a division of Eli Lilly and Company, Dept. E-455, Indianapolis, Indiana 46206, U.S.A.

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A SAFE, SENSIBLE SOLUTION FOR WATER WEEDS.

It's called ORTHO Diquat.

Until recently chemical control of aquatic vegetation has been a big disappointment. Either it didn't work at all or it destroyed things indiscriminately. Diquat solves both problems. It's highly effective against a broad variety of both floating and submerged weeds. It's amazingly fast acting and easy to apply. Nor does it stay around long because it's deactivated on contact with soil in any form.

Diquat when used as directed is safe for fish, too. In fact, the safe levels of Diquat to fish are 2 to 4 times greater than the maximum dosage recommended. You use it with complete confidence.

Diquat is specially recommended for eliminating weed congestion in boating areas, ponds, lakes, residential water fronts, drainage canals, and commercial waterways.

Look around your town, your county. You probably know of dozens of places needing the ORTHO Diquat treatment right now.

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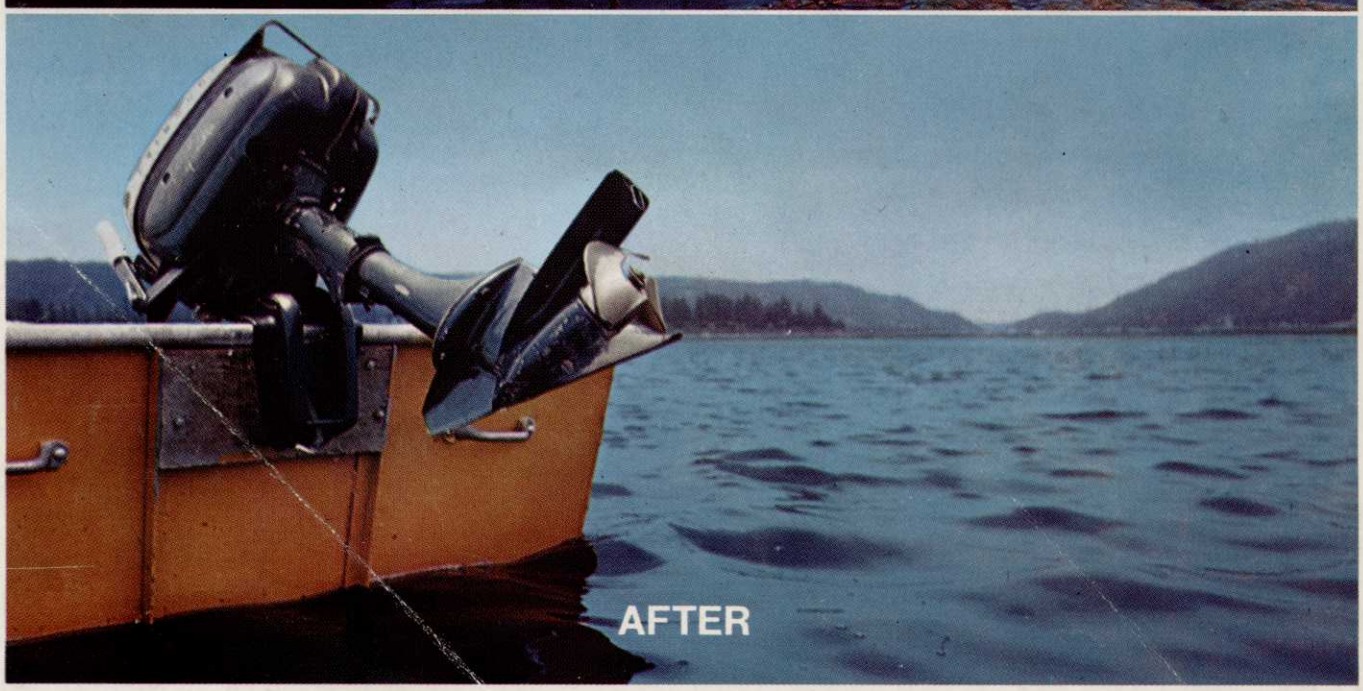

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